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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N74-33425 Engineering Sciences Data Unit, London (England).
EFFECT OF CUT-OUT ON LIFT-CURVE SLOPE
May 1974 2 p refs
(ESDU-Wings-01.01.04-Amend-A) Copyright. Avail: Issuing Activity

The ratio a sub c/a is plotted against b sub c/b for various values of c sub c/c. The values of a sub c were obtained by using theory for a wing with a rectangular central cut-out, although the values are applicable to a tailplane. The part covered by the body is included in the calculation of the area S, with the leading and trailing edges being continued to the plane of symmetry. The lift-curve slope is influenced only minimally by the interruption of the tailplane if the tailplane is mounted on the body with only a small gap between body and elevator. The effect of the cut-out is negligible. Author

N74-33426*# North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
DEVELOPMENT OF COMPUTER PROGRAMS TO DETERMINE THE AERODYNAMIC CHARACTERISTICS OF COMPLETE LIGHT AIRCRAFT Final Report, 15 Aug. 1972 - 31 Oct., 1974
Frederick O. Smetana Oct. 1974 10 p
(Grant NGR-34-002-179)
(NASA-CR-139690) Avail: NTIS HC $4.00 CSCL 01B

A computer program for determining the flight characteristics of light aircraft was developed. The parameters which were used in the computer program are defined. The accuracy of the system for various types of airfoils is analyzed and the airfoils for which the system does not provide adequate data are identified. The application of a computer program for predicting the fuselage characteristics is discussed. The assumptions and parameters of the fuselage characteristics program are explained. It is stated that the computer programs make it possible to determine the response of a light aircraft to a small disturbance given the geometric and inertial characteristics of the aircraft. Author

N74-33427*# Lockheed-Georgia Co., Marietta.
CALCULATION OF UNSTEADY TRANSONIC AERODYNAMICS FOR OSCILLATING WINGS WITH THICKNESS (COMPUTER PROGRAM)
S. Y. Ruo Sep. 1974 57 p ref
(Contract NAS1-11156)
(NASA-CR-132477) Avail: NTIS HC $3.75 CSCL 01A

A computer program has been developed to account approximately for the effects of finite wing thickness in the transonic potential flow over an oscillating wing of finite span. The program is based on the original sonic-box program of Rodemich and Andrew, and accounts for the nonuniform flow caused by finite thickness by application of the local linearization concept. A brief description of each subroutine is given, and the method of input is shown in detail. A sample problem as well as a complete listing of the computer program are presented. Author

N74-33428# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A MODIFIED THEODORSEN EPSILON-FUNCTION AIRFOIL DESIGN PROCEDURE
Raymond L. Barger Washington Sep. 1974 19 p refs
(NASA-TN-D-7741; L-9578) Avail: NTIS HC $3.00 CSCL 01A

The Theodorsen theory of airfoil design for incompressible flow can be used with the modifications proposed in this paper to design airfoils that satisfy a much wider variety of pressure variations than are permitted by the original Theodorsen procedure. Several examples illustrating this method are computed and discussed. Author

N74-33429*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IMPROVEMENTS TO THE KERNEL FUNCTION METHOD OF STEADY, SUBSONIC LIFTING SURFACE THEORY
Richard T. Medan Mar. 1974 54 p refs
(NASA-TM-X-62327) Avail: NTIS HC $3.75 CSCL 01A

The application of a kernel function lifting surface method to three dimensional, thin wing theory is discussed. A technique for determining the influence functions is presented. The technique is shown to require fewer quadrature points, while still calculating the influence functions accurately enough to guarantee convergence with an increasing number of spanwise quadrature points. The method also treats control points on the wing leading and trailing edges. The report introduces and employs an aspect of the kernel function method which apparently has never been used before and which significantly enhances the efficiency of the kernel function approach. Author

N74-33430*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LOW-SPEED AERODYNAMIC CHARACTERISTICS OF AIRFOIL SECTIONS WITH ROUNDED TRAILING EDGES IN FORWARD AND REVERSE FLOW
William D. Beasley and Robert J. McGhee Washington Sep. 1974 104 p refs
(NASA-TM-X-3060; L-9327) Avail: NTIS HC $4.50 CSCL 01A

Low-speed wind-tunnel tests were conducted to determine the two-dimensional aerodynamic characteristics of 6-, 12-, and 18-percent-thick airfoil sections with rounded trailing edges in both forward and reverse flow. The shapes incorporated camber with both the leading and trailing edges rounded to provide reasonable aerodynamic performance with either edge directed toward the free-stream flow. The tests were conducted with the airfoils in both normal and reverse orientations relative to the free stream. The Mach number was varied from 0.16 to 0.36 and the angle of attack was varied from minus 10 to 24 million.

Reynolds number, based on the airfoil chord, was varied from about 1.0 to 12.0 million. Author

N74-33431*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DEVELOPMENT OF A COMPUTER PROGRAM TO OBTAIN ORDINATES FOR NACA-6 AND 6A-SERIES AIRFOILS
Charles L. Ladson and Cuyler W. Brooks, Jr. Washington Sep. 1974 103 p refs
(NASA-TM-X-3069; L-9558) Avail: NTIS HC $4.50 CSCL 01A

A computer program was developed to produce the ordinates for airfoils of any thickness, thickness distribution, or camber in the NACA 6- and 6A-series. For the 6-series and for all but the leading edge of the 6A-series, agreement between the ordinates obtained from the new program and previously published values is generally within .00005 chord. Near the leading edge of the 6A-series airfoils, differences up to .00035 chord are found. Author

N74-33432*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STABILITY AND CONTROL CHARACTERISTICS AT MACH NUMBERS FROM 0.20 TO 4.63 OF A CRUCIFORM AIR-TO-AIR MISSILE WITH TRIANGULAR CANARD CONTROLS AND A TRAPEZOIDAL WING
Ernald B. Graves and Roger H. Fournier Washington Jul. 1974 235 p
(NASA-TM-X-3070; L-9577) Avail: NTIS HC $6.00 CSCL 16D

Investigations have been conducted in the Langley 8-foot transonic pressure tunnel and the Langley Unitary Plan wind tunnel at Mach numbers from 0.20 to 4.63 to determine the stability and control characteristics of a cruciform air-to-air missile with triangular canard controls and a trapezoidal wing. The results indicate that canards are effective in producing pitching moment throughout most of the test angle-of-attack and Mach number range and that the variations of pitching moment with lift for trim conditions are relatively linear. There is a decrease in canard effectiveness with an increase in angle of attack up to about Mach 2.50 as evidenced by the beginning of coalescence of the pitching-moment curves. At a Mach number above 2.50, there is an increase in effectiveness at moderate to high angles of attack. Simulated launch straps have little effect on the lift and pitch characteristics but do cause an increase in drag, and this increase in drag induces a rolling moment at a zero roll attitude where the straps cause an asymmetric geometric shape. The canards are not suitable devices for roll control and, at some Mach numbers and roll attitudes, are not effective in producing pure yawing moments. Author

N74-33433*# Pennsylvania State Univ., University Park.
THE VORTEX LATTICE METHOD FOR THE ROTOR-VORTEX INTERACTION PROBLEM
Raghuveera Padakannaya Washington NASA Jul. 1974 141 p refs
(Grant NGR-39-009-111)
(NASA-CR-2421) Avail: NTIS HC $4.75 CSCL 01A

The rotor blade-vortex interaction problem and the resulting impulsive airloads which generate undesirable noise levels are discussed. A numerical lifting surface method to predict unsteady aerodynamic forces induced on a finite aspect ratio rectangular wing by a straight, free vortex placed at an arbitrary angle in a subsonic incompressible free stream is developed first. Using a rigid wake assumption, the wake vortices are assumed to move downsteam with the free steam velocity. Unsteady load distributions are obtained which compare favorably with the results of planar lifting surface theory. The vortex lattice method has been extended to a single bladed rotor operating at high advance ratios and encountering a free vortex from a fixed wing upstream of the rotor. The predicted unsteady load distributions on the model rotor blade are generally in agreement with the experimental results. This method has also been extended to full scale rotor flight cases in which vortex induced loads near the tip of a rotor blade were indicated. In both the model and the full scale rotor blade airload calculations a flat planar wake was assumed which is a good approximation at large advance ratios because the downwash is small in comparison to the free stream at large advance ratios. The large fluctuations in the measured airloads near the tip of the rotor blade on the advance side is predicted closely by the vortex lattice method. Author

N74-33434*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FURTHER ANALYSIS OF BROADBAND NOISE MEASUREMENTS FOR A ROTATING BLADE OPERATING WITH AND WITHOUT ITS SHED WAKE BLOWN DOWNSTREAM
James Scheiman Washington Sep. 1974 63 p refs
(NASA-TN-D-7623; L-9349) Avail: NTIS HC $3.75 CSCL 01A

An experimental investigation has been conducted to investigate the broadband noise generated by a rotating-blade system. Tests were made with circular and NACA 0012 rotor-blade sections. The blades were operated only with zero lift at each radial station. Tests were made both with zero axial velocity, so that the blades operated in their own turbulent wake, and with a small axial velocity imposed by the wind tunnel to blow the wake of one blade away before the passage of the next blade. The rotor with cylindrical blades generally radiated more noise throughout the noise spectrum than did the rotor with airfoil blades. Blowing the blade wake away from the rotor with cylindrical blades did not have any appreciable effect on the amplitude frequency spectrum, and the predominant noise was broadband, either with tunnel wind on or off. For the rotor with airfoil blades, however, blowing the blade wake away changed the character of the noise spectrum completely in that broadband noise was eliminated or diminished to such an extent as to be indistinguishable. The broadband noise of the airfoil-bladed rotor with zero axial velocity is apparently caused by lift fluctuations due to velocity components of the turbulence normal to the plane of rotation. Author

N74-33435*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BOUNDARY-LAYER TRANSITION ON A PLATE SUBJECTED TO SIMULTANEOUS SPANWISE AND CHORDWISE PRESSURE GRADIENTS
Donald R. Boldman and Paul F. Brinich Washington Sep. 1974 33 p refs
(NASA-TM-X-3107; E-7979) Avail: NTIS HC $3.25 CSCL 01A

The boundary-layer transition on a short plate was studied by means of the china-clay visual technique. The plate model was mounted in a wind tunnel so that it was subjected to small simultaneous spanwise and chordwise pressure gradients. Results of the experimental study, which was performed at three subsonic velocities, indicated that the transition pattern was appreciably curved in the spanwise direction but quite smooth and well behaved. Reasonable comparisons between predictions of transition and experiment were obtained from two finite-difference two-dimensional boundary-layer calculation methods which incorporated transition models based on the concept of a transition intermittency factor. Author

N74-33436*# Kansas Univ., Lawrence. Flight Research Lab.
AN ANALYTICAL INVESTIGATION OF WING-JET INTERACTION
C. Edward Lan [1974] 145 p refs
(Grant NGR-17-002-107)
(NASA-CR-138140; CRINC-FRL-74-001) Avail: NTIS HC $10.25 CSCL 01A

The aerodynamic interaction between the wing and an inviscid jet with Mach number nonuniformity is investigated using a two vortex sheet model for the jet. It is shown that one of the vortex sheets accounts for the induced jet flow, and the other, the induced outer flow. Various characteristics of the upper-surface-blowing STOL configuration are also discussed. M.C.F.

N74-33437*# New York Univ., N.Y.
LEE SURFACE FLOW PHENOMENA OVER SPACE SHUTTLE AT LARGE ANGLES OF ATTACK AT M SUB INFINITY EQUAL 6
V. Zakkay, M. Miyazawa, and C. R. Wang [1974] 180 p refs
(Grant NGR-33-016-179)
(NASA-CR-132501) Avail: NTIS HC $5.50 CSCL 20D

Surface pressure and heat transfer, flow separation, flow

field, and oil flow patterns on the leeward side of a space shuttle orbiter model are investigated at a free stream Mach number of 6. The free stream Reynolds numbers are between 1.64 times 10 to the 7th power and 1.31 times 10 to the 8th power per meter, and the angle of attack is varied between 0 deg and 40 deg for the present experiments. The stagnation temperatures for the tests are approximately 500 K and the wall temperature is maintained at 290 K. Existing numerical methods of three-dimensional inviscid supersonic flow theory and compressible boundary layer theory are used to predict the present experimental measurements. Results of the present tests indicate two distinct types of flow separation and surface peak heating depending on the angle of attack. Author

N74-33438*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WIND TUNNEL TEST OF LOW BOOM EQUIVALENT BODY AT MACH 4
Floyd G. Howard and Odell A. Morris Sep. 1974 16 p refs
(NASA-TM-X-72013) Avail: NTIS HC $3.00 CSCL 01A

A body of revolution, representing the equivalent area distribution of a low boom aircraft design cruising at 24,384 meters at a Mach number of 4, was tested to determine whether its theoretical sonic boom characteristics could be experimentally verified. Results indicate that the essential features of the ground signature are well predicted. Author

N74-33439*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF ROTOR-TO-STATOR SPACING ON ACOUSTIC PERFORMANCE OF A FULL-SCALE FAN (QF-5) FOR TURBOFAN ENGINES
Joseph R. Balombin and Edward G. Stakolich Washington Sep. 1974 71 p refs
(NASA-TM-X-3103; E-7879) Avail: NTIS HC $3.75 CSCL 21E

A study was made of the effect of increasing the fan rotor-to-stator spacing on the noise level of a full-scale, single-stage, 1.6-pressure-ratio fan. Noise data were obtained with axial spacing of 1.14, 1.65, and 2.27 rotor chord lengths. Over this spacing range, data indicate a reduction of 1.5 PNdb. Apparently, rotor-alone noise at the frequency at which the rotor-stator interaction noise was cut off limited the noise reduction for the QF-5 fan. It seems, however, that the reduction in sound power level with increases in spacing is potentially about 6 db over the range of spacing tested. Author

N74-33440# National Aerospace Lab., Amsterdam (Netherlands).
LOW SPEED WIND TUNNEL MEASUREMENTS ON A TWO-DIMENSIONAL FLAPPED WING MODEL USING TUNNEL WALL BOUNDARY LAYER CONTROL AT THE WING-WALL JUNCTIONS
D. M. deVos 9 Apr. 1973 58 p refs
(NLR-TR-70050-U) Avail: NTIS HC $6.00

An investigation on a two-dimensional wing model with a double-slotted trailing edge flap is described where tunnel wall boundary layer control by blowing was applied to prevent premature flow separations at the junctions between the model and the tunnel walls. From the results it is concluded that tunnel wall boundary layer control at the wall junctions is necessary to obtain useful results from two-dimensional high-lift tests in wind-tunnels. It is shown that a relatively simple system of compressed air blowing slots in the tunnel walls gives a sufficient approximation of the desired two-dimensional flow pattern. The blowing system has already been applied on a routine basis to wing sections with trailing edge and also leading edge high-lift devices. Author (ESRO)

N74-33441# National Aerospace Lab., Amsterdam (Netherlands). Flight Dynamics Div.
EXPERIMENTAL RESULTS AROUND THE DESIGN CONDITION OF A QUASI-ELLIPTICAL AEROFOIL MODIFIED FOR REAR LOADING
J. Zwaaneveld and J. A. VanEgmond 20 Jun. 1972 18 p refs Sponsored by Neth. Agency for Aerospace Programs
(NLR-TR-72078-U) Avail: NTIS HC $4.00

A wind tunnel investigation was performed on the 14.1% thick modified quasi-elliptical airfoil NLR 7101. The modification concerns the lower part of the section in order to increase the lift by means of rear loading. The design lift coefficient at m(inf.) = 0.738 increases from c sub l = 0.254 to c sub l = 0.45 on the basis of potential flow theory. The experimental results around the design condition are presented. Lift, drag, and pitching-moment coefficients are given together with representative pressure-distribution diagrams and shadow photographs. The investigation was performed on an 18 cm chord two-dimensional model at a Reynolds number of about 2 million. The results confirm that shockless flow can be realized at flow conditions close to the design point. Author (ESRO)

N74-33442# National Aerospace Lab., Amsterdam (Netherlands). Flight Dynamics Div.
ON THE PREDICTION OF AERODYNAMIC LOADS ON OSCILLATING WINGS IN TRANSONIC FLOW
H. Tijdeman and R. J. Zwaan 22 Jun. 1973 51 p refs Presented at the 36th Meeting of the Struct. and Mater. Panel, Milan, 4 Apr. 1973
(NLR-MP-73026-U) Avail: NTIS HC $5.75

Possibilities to develop calculation methods for oscillating wings in transonic flow are discussed. Special attention is given to the question of linearization. Recent NLR results of pressure measurements on an airfoil with flap in transonic flow are analyzed. Correlations are made between steady, quasi-steady and unsteady results. Shock motion and shock strength are investigated. Also linearity is discussed. A calculation method for high subsonic flow is suggested. Author (ESRO)

N74-33443# National Aerospace Lab., Amsterdam (Netherlands). Flight Dynamics Div.
RESULTS OF PRESSURE MEASUREMENTS ON AN AIRFOIL WITH OSCILLATING FLAP IN TWO-DIMENSIONAL HIGH SUBSONIC AND TRANSONIC FLOW (ZERO INCIDENCE AND ZERO MEAN FLAP POSITION)
H. Tijdeman and P. Schippers 13 Jul. 1973 43 p refs Sponsored by Neth. Agency for Aerospace Programs
(NLR-TR-73078-U) Avail: NTIS HC $5.25

Nonstationary pressure distributions and aerodynamic derivatives are presented for a NACA 64A006 airfoil with oscillating flap in Mach number range from 0.5 to 1.00. Values for the reduced frequency between 0 and 0.39 are included. The results supersede a part of the earlier results given in NLR report TR F253. Author (ESRO)

N74-33444# Calspan Corp., Buffalo, N.Y.
INVESTIGATION OF PLUME EFFECTS ON THE STABILITY CHARACTERISTICS OF A BODY OF REVOLUTION WITH VARIOUS FIN CONFIGURATIONS AT TRANSONIC SPEEDS
R. E. DeKuyper May 1974 493 p refs
(Contract DAAH03-74-C-0202)
(AD-782208; CALSPAN-AA-4017-W-11) Avail: NTIS CSCL 16/4

A transonic wind tunnel test was performed in the Calspan Corporation 8-Foot Transonic Wind Tunnel on a missile model with tail fins in the presence of a simulated jet plume. The test was conducted during February, 1974. The purpose of the test was to establish a correlation between the thrust level and missile longitudinal stability, and to assess the effectiveness of locating stabilizing fins forward of the model base as a means of alleviating adverse plume effects. This was the second series of tests performed with this model at Calspan. The results of the earlier test, which also included a canard effectiveness study, were previously reported. The test was conducted over a Mach number range from 0.40 to 1.25 at a condition corresponding to a wind-off static pressure of 0.5 atmospheres. Model angle of attack was varied from -4 to 12 degrees. GRA

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N74-33445*# Systems Technology, Inc., Hawthorne, Calif.
TURBULENCE FLIGHT DIRECTOR ANALYSIS AND PRELIMINARY SIMULATION
Donald E. Johnson and Richard E. Klein Jun. 1974 90 p refs
(Contract NASw-2118)
(NASA-CR-140487; ITR-1003-2) Avail: NTIS HC $7.50 CSCL 01C

A control column and trottle flight director display system is synthesized for use during flight through severe turbulence. The column system is designed to minimize airspeed excursions without overdriving attitude. The throttle system is designed to augment the airspeed regulation and provide an indication of the trim thrust required for any desired flight path angle. Together they form an energy management system to provide harmonious display indications of current aircraft motions and required corrective action, minimize gust upset tendencies, minimize unsafe aircraft excursions, and maintain satisfactory ride qualities. A preliminary fixed-base piloted simulation verified the analysis and provided a shakedown for a more sophisticated moving-base simulation to be accomplished next. This preliminary simulation utilized a flight scenario concept combining piloting tasks, random turbulence, and discrete gusts to create a high but realistic pilot workload conducive to pilot error and potential upset. The turbulence director (energy management) system significantly reduced pilot workload and minimized unsafe aircraft excursions. Author

N74-33446*# Kanner (Leo) Associates, Redwood City, Calif.
A NEW AVIATION FOR HEAVY TRANSPORT
Jean Bertin Washington NASA Sep. 1974 16 p Transl. into ENGLISH of "Une Nouvelle Aviation de Tranport Lourd" Paris, Aeronaut. Astronaut., no. 46, 1974-3 p 2-8
(Contract NASw-2481)
(NASA-TT-F-15935) Avail: NTIS HC $4.00 CSCL 01C

A study was conducted to determine optimum aerodynamic configurations of aircraft for heavy transport operations. The disadvantages of current passenger aircraft for cargo transportation are explained. The factors considered in the study are: (1) the speed of the aircraft for optimum performance, (2) the dimensions and unit tonnage capability, (3) the use of air cushion landing gear for increased load capacity, (4) the use of airdrop techniques for increasing efficiency, and (5) the selection of power plants. Diagrams and illustrations of proposed aircraft configurations are provided. Author

N74-33447# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
AIRCRAFT ACCIDENT REPORT: TRANS WORLD AIRLINES, INCORPORATED, BOEING 707-131B, N757TW, LOS ANGELES, CALIFORNIA, 16 JANUARY 1974
14 Aug. 1974 30 p
(NTSB-AAR-74-10) Avail: NTIS HC $4.50

An aircraft accident caused by the collapse of the nose gear on a Boeing 707 aircraft during landing after a night visual approach to the Los Angeles airport is discussed. Injuries to eight passengers were incurred during the emergency exit and the aircraft was destroyed by fire. The cause of the accident was determined to be continuation of a visual approach after the external visual reference was lost due to low cloud and fog. Author

N74-33448*# Massachusetts Inst. of Tech., Cambridge. Measurement Systems Lab.
DIGITAL FLIGHT CONTROL RESEARCH Final Report
J. E. Potter, R. G. Stern, T. B. Smith, and P. Sinha Washington NASA Aug. 1974 211 p refs
(Contract NAS1-10677)
(NASA-CR-2433) Avail: NTIS HC $5.75 CSCL 01C

The results of studies which were undertaken to contribute to the design of digital flight control systems, particularly for transport aircraft are presented. In addition to the overall design considerations for a digital flight control system, the following topics are discussed in detail: (1) aircraft attitude reference system design, (2) the digital computer configuration, (3) the design of a typical digital autopilot for transport aircraft, and (4) a hybrid flight simulator. Author

N74-33449# Advisory Group for Aerospace Research and Development, Paris (France).
HELICOPTOR OPERATIONAL LOADS SPECTRUM AND DESIGN CRITERIA
A. J. Gustafson, Jr. (Army Mobility R and D Lab., Fort Eustis, Va.) Jul. 1974 11 p refs
(AGARD-R-622) Avail: NTIS HC $4.00

The USAAMRDL helicopter loads programs have proceeded along three complementary lines: (1) loads prediction techniques. (2) mission spectrum development, and (3) loads measurement. The loads measurement programs involved the measurement of several flight parameters on helicopters performing actual missions in SEA and CONUS. The flight parameters were: airspeed; attitude; vertical, lateral, and longitudinal acceleration at the helicopter's center of gravity; outside air temperature; main rotor speed; engine torque; and longitudinal, lateral, and collective stick positions versus time. Five basic types of aircraft were instrumented: cargo, crane, utility, observation, and gunship. The operational profiles deduced from the field data were compared to the profiles used in the design of the aircraft. The results of this effort are currently being used to construct mission profiles for the next generation designs for these types of aircraft. Author

N74-33450*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIGHTNING DAMAGE TO A GENERAL AVIATION AIRCRAFT: DESCRIPTION AND ANALYSIS
Paul T. Hacker Washington Sep. 1974 55 p refs
(NASA-TN-D-7775; E-7967) Avail: NTIS HC $3.75 CSCL 01C

The damage sustained by a Beechcraft King Air Model B90 aircraft by a single lightning discharge is presented and analyzed. The incident occurred during landing approach at Jackson, Michigan, on Feb. 19, 1971. In addition to the usual melted-metal damage at the lightning attachment points, there was severe implosion-type damage over a large area on the lower right side of the aircraft and impact- and crushing-type damage on the upper and lower surfaces on the left wingtip near the trailing edge. Analyses indicate that the implosion-type damage was probably caused by lightning-generated shock waves, that the impact-and crushing-type damage was caused by magnetic forces, and that the lightning discharge was a multiple strike with at least 11 strokes separated in time by about 4.5 milliseconds. The evidence indicates that the lightning discharge was rather different from the average in character severity. Author

N74-33451*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EVALUATION OF IMPORTANCE OF LATERAL ACCELERATION DERIVATIVES IN EXTRACTION OF LATERAL-DIRECTIONAL DERIVATIVES AT HIGH ANGLES OF ATTACK
Luat T. Nguyen Washington Oct. 1974 63 p refs
(NASA-TN-D-7739; L-9689) Avail: NTIS HC $3.75 CSCL 01C

A theoretical investigation was conducted to determine the importance of the lateral acceleration (beta) derivatives in the extraction of lateral-directional stability derivatives for swept wing airplanes at high angles of attack. Representative values of lateral acceleration derivatives in yaw and roll (Cn beta and Cl beta) were used in a computer program to generate representative flight motions at several angles of attack and altitudes. The computer-generated motions were then subjected to a parameter identification process based on a modified Newton-Raphson method. Two identification techniques were evaluated, one which

included the beta derivatives and one which neglected them. The results of the study indicate that omission of the beta derivatives from mathematical models used in the derivative-extraction techniques can produce erroneous values for the lateral-directional stability derivatives particularly at high angles of attack, where the beta derivatives are large. The largest errors ockur in the dynamic derivatives, but large errors may also occur in the static derivatives for cases in which the beta derivatives have large effects on the flight motions of the airplane. In addition, the resulting identified mathematical models provide poor motion prediction as well as erroneous predictions of dynamic modal characteristics. These results strongly indicate that the effects of beta derivatives should be considered in any attempt to extract lateral-directional aerodynamic parameters at high angles of attack. Author

N74-33452*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A FLIGHT INVESTIGATION WITH A STOL AIRPLANE FLYING CURVED, DESCENDING INSTRUMENT APPROACH PATHS
Margaret S. Benner, Milton D. McLaughlin, Richard H. Sawyer, Roger VanGunst, and John L. Ryan Washington Oct. 1974 54 p refs
(NASA-TN-D-7669; L-9549) Avail: NTIS HC $3.75 CSCL 01C

A flight investigation using a De Havilland Twin Otter airplane was conducted to determine the configurations of curved, 6 deg descending approach paths which would provide minimum airspace usage within the requirements for acceptable commercial STOL airplane operations. Path configurations with turns of 90 deg, 135 deg, and 180 deg were studied; the approach airspeed was 75 knots. The length of the segment prior to turn, the turn radius, and the length of the final approach segment were varied. The relationship of the acceptable path configurations to the proposed microwave landing system azimuth coverage requirements was examined. Author

N74-33453*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
OPTIMAL AND SUBOPTIMAL CONTROL TECHNIQUE FOR AIRCRAFT SPIN RECOVERY
John W. Young Washington Oct. 1974 29 p refs
(NASA-TN-D-7714; L-9625) Avail: NTIS HC $3.25 CSCL 01B

An analytic investigation has been made of procedures for effecting recovery from equilibrium spin conditions for three assumed aircraft configurations. Three approaches which utilize conventional aerodynamic controls are investigated. Included are a constant control recovery mode, optimal recoveries, and a suboptimal control logic patterned after optimal recovery results. The optimal and suboptimal techniques are shown to yield a significant improvement in recovery performance over that attained by using a constant control recovery procedure. Author

N74-33454*# Massachusetts Inst. of Tech., Cambridge. Flight Transportation Lab.
SIMULATOR EVALUATION OF MANUALLY FLOWN CURVED INSTRUMENT APPROACHES M.S. Thesis
Dennis Sager 4 Jan. 1973 121 p refs
(Grant NGL-22-009-640)
(NASA-CR-132505) Avail: NTIS HC $9.25 CSCL 01C

Pilot performance in flying horizontally curved instrument approaches was analyzed by having nine test subjects fly curved approaches in a fixed-base simulator. Approaches were flown without an autopilot and without a flight director. Evaluations were based on deviation measurements made at a number of points along the curved approach path and on subject questionnaires. Results indicate that pilots can fly curved approaches, though less accurately than straight-in approaches; that a moderate wind does not effect curve flying performance; and that there is no performance difference between 60 deg. and 90 deg. turns. A tradeoff of curve path parameters and a paper analysis of wind compensation were also made. Author

N74-33455*# Boeing Commercial Airplane Co., Seattle, Wash.
STATIC NOISE TESTS ON AUGMENTOR WING JET STOL RESEARCH AIRCRAFT (C8A BUFFALO)
C. C. Marrs, D. L. Harkonen, and J. V. OKeefe May 1974 102 p refs
(Contract NAS2-7641)
(NASA-CR-137520; D6-41324-1) Avail: NTIS HC $8.25 CSCL 01C

Results are presented for full scale ground static acoustic tests of over-area conical nozzles and a lobe nozzle installed on the Augmentor Wing Jet STOL Research Aircraft, a modified C8A Buffalo. The noise levels and spectrums of the test nozzles are compared against those of the standard conical nozzle now in use on the aircraft. Acoustic evaluations at 152 m (500 ft), 304 m (1000 ft), and 1216 m (4000 ft) are made at various engine power settings with the emphasis on approach and takeoff power. Appendix A contains the test log and propulsion calculations. Appendix B gives the original test plan, which was closely adhered to during the test. Appendix C describes the acoustic data recording and reduction systems, with calibration details. Author

N74-33456*# Boeing Commercial Airplane Co., Seattle, Wash.
TEST OF ACOUSTIC TONE SOURCE AND PROPULSION PERFORMANCE OF C8A BUFFALO SUPPRESSOR NOZZLE
C. C. Marrs, D. L. Harkonen, and J. V. OKeefe May 1974 408 p refs
(Contract NAS2-7641)
(NASA-CR-137521; D6-41324-2) Avail: NTIS HC $23.50 CSCL 01C

Results are presented for a static acoustic and propulsion performance ground test conducted at the Boeing hot nozzle facility on the C8A Buffalo noise suppressor nozzle. Various methods to remove a nozzle-associated 2000-Hz tone are evaluated. Results of testing this rectangular-array lobed nozzle for propulsion performance and acoustic directivity are reported. Recommendations for future nozzle modifications and further testing are included. Appendix A contains the test plan. Appendix B presents the test log. Appendix C contains plots of the one-third octave sound pressure levels recorded during the test. Appendix D describes the acoustic data recording and reduction systems. The performance data is tabulated in Appendix E. Author

N74-33457# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flugzeugsteuerung und- Regelung.
COMPARISON WITH REGARD TO THE ECONOMY OF A DIGITAL AND AN ANALOG ELECTRO-HYDRAULIC ACTUATOR
Claus Brinckmann Porz 23 May 1973 21 p refs In GERMAN; ENGLISH summary
(DLR-FB-73-105) Avail: NTIS HC $4.25; DFVLR, Porz, West Ger. 8 DM

A digital hydraulic actuator for linear motion, consisting of cylinders in series, is compared with an analog servo-actuator with the comsumption of pressurized oil as an index for economic operation. A description is given for the economic boundaries in general and for the special case as an actuator in aircraft control systems. Author (ESRO)

N74-33458# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flugzeugsteuerung und -Regelung. pop Porz
CONTRIBUTION TO THE DYNAMIC BEHAVIOR OF A DIGITAL ELECTRO-HYDRAULIC ACTUATOR
Claus Brinckmann 14 Jun. 1973 55 p refs In GERMAN; ENGLISH summary
(DLR-FB-73-106) Avail: NTIS HC $5.75; DFVLR, Porz, West Ger. 13.50 DM

A method of temporary hydraulic locking is described for a digital electrohydraulic linear actuator, consisting of cylinders in series. The digital actuator concept has been developed for fly by wire aircraft control using digital electric signal transmission. The locking principle described avoids initial motion in the wrong direction even for loaded conditions of the actuator. ESRO

N74-33459# Air Force Flight Test Center, Edwards AFB, Calif.
BACKGROUND INFORMATION AND USER GUIDE FOR

MIL-S-83691 Final Report
Patrick S. Sharp and Collet E. McElroy Mar. 1974 109 p refs
(AD-780523; AFFTC-TD-73-2) Avail: NTIS CSCL 15/7

The report is the Background Information and User Guide (BIUG) for Military Specification MIL-S-83691A (USAF), Stall/Post-Stall/Spin Flight Test Demonstration Requirements for Airplanes. The purposes of the BIUG are: to provide an aid in the interpretation and application of MIL-S-83691A (USAF), and to establish guidelines by which a flight test program can be planned, conducted and reported according to the demonstration specification. It is only an explanatory document and is therefore not contractually binding. However, since the BIUG does amplify upon the intent of the requirements and other provisions of MIL-S-83691A (USAF), it should be considered as a useful tool in the proper technical and contractual application of the flight test specification. Author (GRA)

N74-33460# Northrop Corp., Hawthorne, Calif. Aircraft Div.
ADVANCED METALLIC STRUCTURE: AIR SUPERIORITY FIGHTER WING DESIGN FOR IMPROVED COST, WEIGHT AND INTEGRITY. VOLUME 3: MATERIALS TEST PROGRAM Final Report, Oct. 1972 - Mar. 1973
Fred A. Figge Jun. 1973 183 p refs
(Contract F33615-72-C-1891; AF Proj. 406U)
(AD-781812; NOR-73-82-Vol-3; AFFDL-TR-73-52-Vol-3) Avail: NTIS CSCL 01/3

The portion of the Phase 1A Program assessed some of the new alloys and heat treatments which could become production materials within the next few years. The alloys and product forms were selected based upon their mechanical properties and their potential usefulness in a thin fighter-wing structure. GRA

N74-33461# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
TAKEOFF AND LANDING ANALYSIS COMPUTER PROGRAM (TOLA). PART 3: USERS MANUAL
Urban H. D. Lynch and John J. Dueweke Apr. 1974 102 p ref
(AD-781758; AFFDL-TR-71-155-Pt-3) Avail: NTIS CSCL 01/2

TOLA is an acronym for TakeOff and Landing Analysis digital computer program. This part describes the use of the program. The basic program provides six rigid-body degrees of freedom of aerospace vehicle motion over a flat planet and determines the response of the aircraft to control inputs. The dynamics of up to five independent oleo-type struts are included for simulation of symmetrical and nonsymmetrical landings as well as drop tests. A maneuver logic is programmed to provide vehicle guidance in the various phases of the problem; it determines the desired trim and position in the glide slope and provides synthesis and attempted completion of necessary flare dynamics for prescribed touchdown velocity vector. The landing roll includes wheel spinup and braking, thrust reversing, spoiler deployment, and system failure options. The takeoff roll consists of acceleration to takeoff speed, followed by rotation to takeoff angle of attack. (Modified author abstract) GRA

N74-33462# General Dynamics/Fort Worth, Tex. Convair Aerospace Div.
ADVANCED METALLIC STRUCTURES: AIR SUPERIORITY FIGHTER WING DESIGN FOR IMPROVED COST, WEIGHT AND INTEGRITY. VOLUME 2: DESIGN DATA Final Report, 15 Jun. 1972 - 15 Jun. 1973
D. F. Davis Jul. 1973 565 p
(Contract F33615-72-C-2149)
(AD-781807; AFFDL-TR-73-50-Vol-2) Avail: NTIS CSCL 01/3

During the initial step of the Concept Formulation Phase, one-hundred nineteen (119) Element Concepts were documented. An additional twenty-seven (27) concepts were generated during the cross-section drawing phase of the program. Their weight saving potential was established as part of this effort. Evaluation and utilization of these concepts were based on qualitative and quantitative data discussed in this report. Manufacturing and NDI evaluations were basically qualitative, generally relying on comparison to known industry standards. The wing skin panel concepts were analyzed using a computer program created especially for this effort. GRA

N74-33463# General Dynamics/Fort Worth, Tex. Convair Aerospace Div.
ADVANCED METALLIC STRUCTURES: AIR SUPERIORITY FIGHTER WING DESIGN FOR IMPROVED COST, WEIGHT AND INTEGRITY. VOLUME 3: STRESS, FATIGUE AND FRACTURE, COST AND MATERIAL DATA Final Report, 15 Jun. 1972 - 15 Jun. 1973
D. F. Davis et al Jul. 1973 362 p refs
(Contract F33615-72-C-2149)
(AD-781808; AFFDL-TR-73-50-Vol-3) Avail: NTIS CSCL 01/3

This section presents the portion of results of the flight loads buildup and demonstration tests for the F-111 with no external stores as applicable to the F-111F wing. The entire test program results are reported in Reference 1. These balanced symmetric flight tests were accomplished on F-111A No. 13 and F-111A No. 75. These tests were accomplished to establish the maximum load levels encountered in flight. The ultimate objective of such testing is to show that the loads used for design and the loads applied in static test are adequate. GRA

N74-33464# General Dynamics/Fort Worth, Tex. Convair Aerospace Div.
ADVANCED METALLIC STRUCTURES: AIR SUPERIORITY FIGHTER WING DESIGN FOR IMPROVED COST, WEIGHT AND INTEGRITY. VOLUME 4: BASELINE DAMAGE TOLERANCE EVALUATION Final Report, 15 Jun. 1972 - 15 Jun. 1973
D. F. Davis Jul. 1973 749 p
(AD-781809; AFFDL-TR-73-50-Vol-4) Avail: NTIS CSCL 01/3

The basic objective of this study was to provide an updated analysis of the F-111F baseline wing box reflecting the latest proposed Air Force version of damage tolerance criteria. In addition, sensitivity and trade studies were made on the baseline. The effect on allowable stress and service life due to variation in Klc, da/dN, initial damage assumptions, and service usage were determined. NDI experience, thermal and chemical environment, and the impact of a fracture control plan were studied. Baseline data on inspection experience was compiled. The impact on stress levels and life of varying the residual strength load requirement was determined. GRA

N74-33465# Adaptronics, Inc., McLean, Va.
RPV/SELF-ORGANIZING CONTROL DEMONSTRATION SYSTEM. VOLUME 2: HARDWARE DESCRIPTION, SYSTEM OPERATION AND MAINTENANCE, AND RPV SIMULATION Final Technical Report, 1 Mar. 1972 - 31 Aug. 1973
Dixon Cleveland, James R. Binkley, and Roger L. Barron Feb. 1974 209 p refs
(Contract F33615-72-C-1816; AF Proj. 7233)
(AD-781080; Rept-663-FTR; AMRL-TR-73-67) Avail: NTIS CSCL 01/3

Self-organizing control is a form of adaptive control in which the controller uses an incremental model of the plant and identifies parameters in this model by means of calculations based upon recent-term plant excitation and response histories. This report (in two volumes) presents the theoretical derivation of refinements in self-organizing control techniques yielding substantial reduction of sampling rates of self-organizing controllers and identification of magnitudes as well as polarities of plant gain parameters. Additionally, this report describes the implementation of self-organizing controller logic in the form of breadboard digital hardware, the equations and programs for a PDP-12 computer real-time simulation of remotely piloted vehicle flight with 6 degrees of freedom (without limitation to small aerodynamic angles), and design of a demonstration system. (Modified author abstract) GRA

N74-33466# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
SUBSONIC WIND TUNNEL INVESTIGATION OF THE HIGH LIFT CAPABILITY OF A CIRCULATION CONTROL WING ON A 1/5-SCALE T-2C AIRCRAFT MODEL

Robert J. Englar May 1973 71 p refs
(AD-781856; TN-AL-299) Avail: NTIS CSCL 01/1

A circulation control wing, formed by the deflection of a 15% chord flap through 180 degrees to produce a circular cylinder trailing edge with tangential upper surface blowing, was applied to a 1/5-scale T-2C aircraft model. The flap span/wing span ratio was 0.495, consistent with the conventional aircraft. Subsonic investigations were conducted in the Naval Ship Research and Development Center (NSRDC) 8- by 10-foot North Wind Tunnel over a dynamic pressure range of 5 to 41 psf (Reynolds number based on mean aerodynamic chord of 0.60 to 1.68 million). Flap deflection was varied from 0 to 180 degrees, thus comparing the configurations of blown flap (moderate-to-high lift and lower drag for take-off) and the circular Coanda trailing edge (high lift and high drag for landing). (Modified author abstract) GRA

N74-33467# Army Aviation Systems Test Activity, Edwards AFB, Calif.
FLIGHT EVALUATION OH-6A HELICOPTER. KAISER FP-50B FLIGHT DIRECTOR SYSTEM, PART 2 Final Report, Jan. - Aug. 1973
Warren E. Griffith, II, Albert L. Winn, and Carl F. Mittag Feb. 1974 56 p refs
(AD-781990; USAASTA-72-06-Pt-2) Avail: NTIS CSCL 17/7

The Kaiser FP-50B flight director system was evaluated to determine its operational characteristics when installed in the OH-6A helicopter. The evaluation was performed by workload analysis both with and without the flight director under simulated instrument conditions. Tests were conducted at the United States Army Aviation Systems Test Activity, Edwards Air Force Base, California, from January to August 1973. The flight director installation improved flight accuracy for all phases of instrument flight and generally reduced pilot workload. The system also allowed operation over a wide range of flight conditions with essentially no change in workload. The cathode ray tube display provides a clearly visible, parallax-free indication of the flight director commands. (Modified author abstract) GRA

N74-33468# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
STRUCTURAL DYNAMIC RESPONSE OF AH-1G WING WITH XM35 WEAPON Final Report, Dec. 1972 - Apr. 1973
Adam R. Zak Nov. 1973 53 p refs
(Contract DAHC04-72-A-0001; DA Proj. 1F1-62201-D-025)
(AD-781973; RIA-R-RR-T-6-58-73) Avail: NTIS CSCL 01/3

The report contains an analysis and the numerical results which have been developed for predicting dynamic response of flexible helicopter structures excited by the recoil force of the XM35 weapon. This report is in four parts. The first part contains the analysis of the wing-gun combination alone. The wing is assumed to be clamped rigidly at its root. The recoil force is divided into three components which include the mean force, the sinusoidal component, and the random component. The wing is treated as a flexible structure with lumped masses. The second part of the report contains the analysis of the wing-gun combination but the wing is assumed to be supported elastically at its root. The third part contains the analysis of the total wing-gun combination plus the remaining helicopter structure by the Statistical Energy Analysis (SEA) method. The fourth part of the report describes a computer program which has been developed and the numerical results which have been obtained using the analysis in part one of this report. (Modified author abstract) GRA

N74-33469# Falcon Research and Development Co., Baltimore, Md.
SURVEY OF ANALYSES OF COMBAT DATA FOR US ARMY AIRCRAFT IN SOUTHEAST ASIA, 1962 - 1973
James R. Lindenmuth 18 Apr. 1974 32 p
(Contract F08635-71-C-0199)
(AD-781975; JTCG/ME-74-1) Avail: NTIS CSCL 01/3

The U. S. Army has sponsored a long-range program to collect and analyze data on aircraft damaged by ground fire in Vietnam. This effort, sustained by contributions from many agencies and teams, culminated in a vast data bank of information concerning U. S. rotary- and fixed-wing aircraft in combat, the reactions of these aircraft and their systems to ground fire, and the resulting casualties and fatalities. This report surveys the entire program, the analyses performed on the data, the lessons learned from these analyses, and the various payoffs in terms of survivability improvements to both fielded and future aircraft. Recommendations are offered for additional analyses to more fully exploit the data bank. Author (GRA)

N74-33470# Aerospace Systems, Inc., Burlington, Mass.
A STUDY OF TECHNIQUES FOR REAL-TIME, ON-LINE OPTIMUM FLIGHT PATH CONTROL. THREE DIMENSIONAL MINIMUM-TIME FLIGHT PATHS WITH TWO STATE VARIABLES Interim Report, Dec. 1972 - Nov. 1973
Arthur E. Bryson, Jr., William C. Hoffman, and Chen-Chung Hsin Jan. 1974 37 p refs
(Contract F44620-72-C-0001; AF Proj. 9769)
(AD-782490; ASI-TR-74-18; AFOSR-74-1041TR) Avail: NTIS CSCL 01/2

A study of three-dimensional, minimum-time turning maneuvers for supersonic fighter aircraft is described. For turns which do not specify the end-point position, the optimum maneuvers comprise a one-parameter family of flight paths. All the optimum turns, and their associated control variables can be presented in simple graphical form for a specified aircraft configuration. A feedback control diagram can be easily constructed for all minimum-time turns to a specified final energy level. This feedback chart could be implemented in the airborne computer to provide real-time, on-line optimal flight path control. Numerical results for an early model of the F4 fighter illustrate the control technique. Author (GRA)

N74-33471# Instrument Flight Center, Randolph AFB, Tex.
HELICOPTER PROCEDURAL INNOVATIONS (UNUSUAL ATTITUDES) Final Report
Don L. Baker 21 May 1974 8 p
(IFC Proj. TR/D-74-1)
(AD-782204; IFC-LR-74-3) Avail: NTIS CSCL 01/2

Responding to the recommendations of a HQ USAF All-Commands Helicopter Conference, USAF Instrument Flight Center has initiated a Helicopter Procedural Innovations Program. One phase of the Procedural Innovations Program has addressed helicopter unusual attitude recovery techniques. At the present time, there are no unusual attitude recovery techniques in AFM 51-37 that specifically address rotary-wind aircraft. Although the techniques found in AFM 51-37 are adequate for fixed-wing unusual attitude recoveries, portions need amplification to apply to helicopter recoveries. This is due to the unique aerodynamics of rotary-wing aircraft, as well as a different application of the control and performance concept to helicopters as compared to fixed-wing aircraft. GRA

N74-33472# Bell Helicopter Co., Fort Worth, Tex.
MANEUVER CRITERIA EVALUATION PROGRAM
T. L. Wood, D. G. Ford, and G. H. Brigman May 1974 143 p
(Contract DAAJ02-73-C-0015; DA Proj. 1F2-62208-AH-9001)
(AD-782209; USAAMRDL-TR-74-32) Avail: NTIS CSCL 01/3

The Maneuver Criteria Evaluation Program (MCEP) is a digital computer program which solves the flight path equation of motion for a helicopter without auxiliary propulsion. The use of basic work, energy, and power relationships makes possible accurate representation of flight path trajectories. MCEP can be used to aid in the development of maneuver requirements which provide the necessary maneuver capability to perform the desired mission. This report presents a review of the program capabilities in addition to the background and development of the principal mathematical model in MCEP. A demonstration of MCEP is provided using a typical AH-1G helicopter gunship mission. (Modified author abstract) GRA

N74-33473# Douglas Aircraft Co., Inc., Long Beach, Calif.
DEVELOPMENT OF A GRAPHITE HORIZONTAL STABILIZER Interim Technical Report, Jul. 1973 - 28 Feb. 1974
George M. Lehman Apr. 1974 46 p refs
(Contract N00156-70-C-1321)
(AD-782646; MDC-J6507; ITR-8) Avail: NTIS CSCL 01/3

The final assembly bonding, nondestructive inspection, and

static testing of the second graphite-epoxy horizontal stabilizer for the A4 Skyhawk are discussed. The fit checks, bonding technique, and Fokker bond test results for the final assembly bond of the upper skin panel are described. Strain data are presented for static tests in two critical load conditions (i.e., maximum elevator load and maximum stabilizer load). Predicted and actual strain plots indicating good correlation are presented for selected strain gages. During ultimate load tests, the stabilizer sustained some structural damage as indicated by significant strain redistributions within the structure. The cause of the damage, a delamination of the front-spar lower attach angle, was diagnosed as a local eccentricity in load pathe (omission of a shear clip on one side of the front-spar shear web) at a critical location where a high local test load was applied. A rework plan is presented to remove the eccentricity and repair the damaged structure prior to resumption of testing.
Author (GRA)

N74-33474# Decision Science, Inc., San Diego, Calif.
PRINCIPLES OF DISPLAY AND CONTROL DESIGN FOR STRIKE REMOTELY PILOTED VEHICLES RPVs Final Report
Lawrence J. Fogel, Carl E. Englund, Michael L. Mout, and Thomas D. Hertz Jun. 1974 158 p refs
(Contract N00014-72-C-0196)
(AD-782581) Avail: NTIS CSCL 01/3

Principles of display and control design for Remotely Piloted Vehicles (RPVs) were investigated. The difficulties which arise from lack of kinesthetic feedback and problems associated with communicating adequate information to the remote pilot were considered. Attention was focused on the strike mission. A series of experiments were conducted to examine the pilot/subject's ability to control the RPV in flight and perform certain targeting maneuvers under different display and control situations. (Modified author abstract) GRA

N74-33475# National Aviation Facilities Experimental Center, Atlantic City, N.J.
THE MEASUREMENT OF THE BOEING 747 TRAILING VORTEX SYSTEM USING THE TOWER FLY-BY TECHNIQUE Final Report, Sep. - Oct. 1972
Leo J. Garodz, David Lawrence, and Nelson J. Miller Jun. 1974 238 p refs
(FAA Proj. 214-531-070)
(AD-782046; FAA-NA-73-73; FAA-RD-73-156) Avail: NTIS CSCL 01/3

The characteristics of the trailing vortex system of the Boeing 747 airplane have been investigated by the National Aviation Facilities Experimental Center (NAFEC), Atlantic City, N. J., during a series of flight tests conducted in September and October 1972. This investigation is part of a long-term program, started in February 1970 with flight tests conducted by NAFEC at the Atomic Energy Commission site at Idaho Falls, Idaho, devoted to the study of the overall wake turbulence problem. The present tests were conducted using improved flow measurement and meteorological instrumentation, permitting greater resolution than had been possible in earlier testing. Principal findings were that the peak tangential velocity decays as the reciprocal of the square root of the time elapsed since vortex generation; that the peak velocity is unaffected by the throttling back of the adjacent outboard engine; and that the lateral transport velocities correlate quite well with theory. (Modified author abstract) GRA

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N74-33476*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBINE DESIGN AND APPLICATION, VOLUME 2
Arthur J. Glassman, ed. Washington 1973 152 p refs
(NASA-SP-290-Vol-2; LC-79-185105) Avail: NTIS MF $1.45; SOD HC $1.80 CSCL 21E

Turbine energy loss optimization in blade aerodynamic design is discussed. For individual titles, see N74-33477 through N74-33481.

N74-33477* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BLADE DESIGN **c28**
Warner L. Stewart and Arthur J. Glassman *In its* Turbine Design and Appl. Vol. 2 1973 p 1-25 refs (For availability see N74-33476 23-03)
CSCL 21E

The design of turbine blading is considered that will produce the flow angles and velocities required by velocity diagrams consistent with the desired efficiency and/or number of stages. The determination of the size, shape, and spacing of the blades is fundamental. Author

N74-33478* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHANNEL FLOW ANALYSIS **c28**
Theodore Katsanis *In its* Turbine Design and Appl., Vol. 2 1973 p 27-56 refs (For availability see N74-33476 23-03)
CSCL 21E

The design of a proper blade profile requires calculation of the blade row flow field in order to determine the velocities on the blade surfaces. An analysis theory is presented for several methods used for this calculation and associated computer programs that were developed are discussed. Author

N74-33479* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTRODUCTION TO BOUNDARY-LAYER THEORY **c12**
William D. McNally *In its* Turbine Design and Appl., Vol. 2 1973 p 57-92 refs (For availability see N74-33476 23-03)
CSCL 20D

The pressure ratio across a turbine provides a certain amount of ideal energy that is available to the turbine for producing work. The portion of the ideal energy that is not converted to work is considered to be a loss. One of the more important and difficult aspects of turbine design is the prediction of the losses. The primary cause of losses is the boundary layer that develops on the blade and end wall surfaces. Boundary-layer theory is used to calculate the parameters needed to estimate viscous (friction) losses. Author

N74-33480* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BOUNDARY-LAYER LOSSES **c12**
Herman W. Prust, Jr. *In its* Turbine Design and Appl., Vol. 2 1973 p 93-124 refs (For availability see N74-33476 23-03)
CSCL 20D

The primary cause of losses in a turbine is the boundary layer that builds up on the blade and end-wall surfaces. Analytical and experimental methods for determining the friction, trailing edge, and mixing losses associated with the boundary layer are reported. The theory presented herein refers primarily to two dimensional blade section boundary layers. Methods for obtaining three dimensional blade plus end wall losses from the two-dimensional results are also discussed. Author

N74-33481* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MISCELLANEOUS LOSSES **c28**
Richard J. Roelke *In its* Turbine Design and Appl., Vol. 2 1973 p 125-148 refs (For availability see N74-33476 23-03)
CSCL 21E

The boundary-layer losses associated with the flow process in the blade channel are discussed. To determine the overall design point efficiency of a turbine, other losses must also be considered; these include tip clearance loss and disk friction loss. The sum of these losses normally comprises all the losses that are considered in the design of a full admission axial flow turbine. If, however, a partial admission turbine is being considered, there are additional losses that must be included. The partial admission losses usually considered are the pumping loss in the inactive blade channels and the filling-and-emptying loss in the

blade passages as they pass through the admission arc. Finally, a loss that occurs at off-design operation of any turbine is the incidence loss. Author

N74-33482*# Duke Univ., Durham, N.C. Dept. of Electrical Engineering.
RESEARCH ON SPACECRAFT ELECTRICAL POWER CONVERSION Status Report, 1 Sep. 1973 - 28 Feb. 1974
Thomas G. Wilson 1 Mar. 1974 10 p refs
(Grant NGL-34-001-001)
(NASA-CR-140038; SR-26) Avail: NTIS HC $4.00 CSCL 10A

The steady state characteristics and starting behavior of some widely used self-oscillating magnetically coupled square wave inverters were studied and the development of LC-tuned square wave inverters is reported. An analysis on high amplitude voltage spikes which occur in dc-to-square-wave parallel converters shows the importance of various circuit parameters for inverter design and for the suppression of spikes. A computerized simulation of an inductor energy storage dc-to-dc converter with closed loop regulators and of a preregulating current step-up converter are detailed. Work continued on the computer aided design of two-winding energy storage dc-to-dc converters. G.G.

N74-33483*# Little (Arthur D.), Inc., Cambridge, Mass.
STRUCTURE AND OPERATING MECHANISMS OF INORGANIC SEPARATORS
John M. Parry, Constance S. Lee, Robert C. Wells 10 Apr. 1974 96 p refs
(Contract NAS3-17337)
(NASA-CR-134692; ADL-75232) Avail: NTIS HC $8.00 CSCL 10C

The structure of the semi-flexible inorganic separator was defined. Also the operating mechanisms of the separator, particularly in the inhibition of silver migration in the silver-zinc cell was identified. The separator consists of an outside surface of the asbestos (0.025 mm thick), which is coated with a film (0.013 mm thick) consisting of polyphenylene oxide, a commercial polymeric plasticizer, a zirconia powder, and needle-like crystals of potassium titanate. The inorganic components are bonded together by the organic components. The asbestos substrate is also impregnated with polyphenylene oxide. It is concluded: (1) the organic components of the separator are responsible for the excellent characteristics in the silver-zinc cell; (2) the inorganic components are possibly important in defining the structure of the coated layer; (3) the inorganic components are unimportant in the establishment of the electrochemical characteristics of the separator; (4) the operating mechanism of the separator depends on a chemical reaction between the plasticizer and potassium hydroxide. It is postulated that as a result of this reaction the thin film observed on the surface of the coating becomes a semipermeable membrane with low resistivity and that is an effective barrier to silver migration. Author

N74-33484*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOLAR CELL ASSEMBLY Patent Application
Henry W. Brandhorst, Jr., inventor (to NASA) Filed 30 Sep. 1974 13 p
(NASA-Case-LEW-11549-1; US-Patent-Appl-SN-510677) Avail: NTIS HC $4.00 CSCL 10A

An improved solar cell assembly is provided for use under high intensity illumination conditions where heat is a problem. The solar cell assembly includes a solar cell with an overlay of a semi-transparent coating of a metal such as aluminum or silver, which covers the entire surface. The purpose of the coating is to lower the amount of incident radiation on the cell and thereby lower cell temperature. Use of the semi-transparent coating over the entire cell surface uniformly limits incident radiation and hence reduces cell heat without any temperature gradients. The coating also lowers series cell resistance. The coating may be directly deposited on the cell surface or on the undersurface of cover plate bonded to the cell. NASA

N74-33485*# National Aeronautics and Space Administration, Washington, D.C.
NASA AND ENERGY
[1974] 16 p
(NASA-EP-121) Avail: NTIS MF $1.45; SOD $0.35 CSCL 10A

NASA technology contributions to create energy sources include direct solar heating and cooling systems, wind generation of electricity, solar thermal energy turbine drives, solar cells, and techniques for locating, producing, and collecting organic materials for conversion into fuel. G.G.

N74-33486*# Moog Servocontrols, Inc., East Aurora, N.Y. Controls Div.
FORCE SHARING IN HIGH-POWER PARALLEL SERVO-ACTUATORS
T. Peter Neal 1 Jun. 1974 105 p refs
(Contract NAS8-27803)
(NASA-CR-120469; MR-E-1905) Avail: NTIS HC $8.25 CSCL 09C

The various existing force sharing schemes were examined by conducting a literature survey. A list of potentially applicable concepts was compiled from this survey, and a brief analysis was then made of each concept, which resulted in two competing schemes being selected for in-depth evaluation. A functional design of the equalization logic for the two schemes was undertaken and specific space shuttle application was chosen for experimental evaluation. The application was scaled down so that existing hardware could be utilized. Next, an analog computer study was conducted to evaluate the more important characteristics of the two competing force sharing schemes. On the basis of the computers study, a final configuration was selected. A load simulator was then designed to evaluate this configuration on actual hardware. Author

N74-33487# Federal Power Commission, Washington, D.C.
ENERGY CONSERVATION HANDBOOK FOR LIGHT INDUSTRIES AND COMMERCIAL BUILDINGS
May 1974 18 p
Avail: NTIS MF $1.45; SOD HC $0.35

Suggested guidelines for surveying energy conservation opportunities in a given plant are reported. These pages were prepared with the help of consulting engineers who have wide experience assisting businessmen and plant operators to improve fuel utilization. The guidelines contain a checklist of places to look for energy conservation opportunities and suggest possible corrective measures to be applied. The survey is divided into two major sections: plant buildings and processes and equipment. Author

N74-33488# RAND Corp., Santa Monica, Calif.
SOME CHARACTERISTICS OF RADIOISOTOPE POWER SOURCES IN AN OCEAN ENVIRONMENT
R. C. Erdmann, E. C. Gritton, and M. J. Ozeroff Mar. 1974 31 p refs
(P-5056-1) Avail: NTIS HC $4.75

The results of this study show that lightweight radioisotope heat sources can be considered for use undersea with little shielding necessary for electronics packages in close proximity to the heat source. Acceptable integrated electronic dose levels for gamma irradiation and neutron bombardment were obtained for extended mission times for the three isotopes considered. For Cm-244 and Co-60 it was found that the shield around the electronics package becomes important due to the strong back scattering effect of neutrons and gammas from the surrounding seawater. Author

N74-33489# RAND Corp., Santa Monica, Calif.
RESIDENTIAL WATER HEATING: FUEL CONSERVATION, ECONOMICS, AND PUBLIC POLICY
James J. Mutch May 1974 87 p refs
(Grant NSF GI-44)
(R-1498-NSF) Avail: NTIS HC $7.50

Several alternatives that may reduce the amount of fossil fuel based energy needed to furnish residential hot water is presented. Thermal losses from the water heating system and the non-renewable energy requirements of the system are two alternatives considered. The economic cost of each measure to the consumer is examined as a function of the price of the fuel, allowing comparison of different fuel conservation approaches in terms of their life cycle costs. The potential of government policy

as a tool for implementation of economically beneficial fuel conservation alternatives is also discussed. M.C.F.

N74-33490# Houston Univ., Tex. Dept. of Physics.
SOLAR THERMAL POWER SYSTEM BASED ON OPTICAL TRANSMISSION
L. L. Vant-Hull and A. F. Hildebrandt [1974] 35 p refs Sponsored in part by NSF
Avail: NTIS HC $4.75

A baseline design, consisting of an array of heliostats that redirect beam radiation onto a receiver atop a 450 meter tower, was developed as part of a technical and economic feasibility study of a solar thermal electric power system based on optical transmission of direct solar energy to a central receiver. Reflector design was also considered, along with guidance, tracking, and control subsystems which include the sensors, electronics, motors, drive trains, and mounts required to support and orient the reflector assembly. A.A.D.

N74-33491# Houston Univ., Tex. Dept. of Physics.
A TOWER-TOP POINT FOCUS SOLAR ENERGY COLLECTOR
A. F. Hildebrandt and L. L. Vant-Hull 20 Mar. 1974 10 p refs Presented at the Hydrogen Econ. Miami Energy Conf., Miami Beach, Fla., 18-20 Mar. 1974 Sponsored in part by ARPA
(Grant NSF GI-39456)
Avail: NTIS HC $4.00

Temperatures over 1000 C appear possible with a large segmented Fresnel mirror consisting of independent hydraulically or electrically steered heliostats constructured of flat mirrors. A central receiver is elevated well above the mirror field on a tower of about 450 meters height, in order that the redirected solar radiation from a square mile radius be intercepted. A collector of such dimensions would produce heat at a peak rate of 500 MWT in the winter and 700 MWT in the summer. Author

N74-33492# General Electric Co., Santa Barbara, Calif. TEMPO Center for Advanced Studies.
HEAT-STORAGE WELLS FOR CONSERVING ENERGY AND REDUCING THERMAL POLLUTION
Charles F. Meyer and David K. Todd (Calif. Univ., Berkeley) Jun. 1973 6 p refs Presented at the 8th Intersociety Energy Conversion Engineering Conf., Philadelphia, Aug. 1973
(P-635) Avail: NTIS HC $4.00

Storing large amounts of useful heat in ground water appears feasible. Preliminary analysis shows that more than three-fourths of the stored heat can be recovered after 90 days; heat storage wells cost less than the cooling facilities they replace; and the necessary underground formations are widely available. For each unit of electricity generated today, two units of low temperature heat energy typically are wasted. Higher temperature heat (350 F) is usable for space heating, absorption air conditioning, water heating, and process heat. Heat at 350 F can be recovered from the exhaust gases of combustion gas turbines. Author

N74-33493# Atomic Energy Commission, Washington, D.C.
CONVERSION TECHNIQUES
R. E. English 13 Nov. 1973 355 p refs
(WASH-1281-6) Avail: NTIS HC $20.75 CSCL 10A

The following eight objectives were established: (1) coal gasification: to develop processes for the production and use of clean low-BTU gas from coal in central power stations; (2) gas turbines: to increase the overall efficiency and reliability of power generation by developing high-temperature gas-turbine systems; (3) MHD: to increase the overall efficiency and reliability of power generation by developing MHD power systems; (4) potassium topping cycle: to increase the overall efficiency and reliability of power generation by developing potassium-vapor topping systems; (5) fuel cells: to develop efficient and economical fuel cells for power generation; (6) use of waste heat and fuel: to develop power systems for economical use of heat and fuel presently wasted; (7) advanced concepts: to evaluate, to investigate, and ultimately to develop advanced concepts for energy conversion; and (8) enabling technology: to evolve substantial improvement of various power systems or entirely new concepts for power generation. Author (NSA)

N74-33494# Atomic Energy Commission, Washington, D.C.
GEOTHERMAL ENERGY PROGRAM
13 Nov. 1973 192 p
(WASH-1281-8) Avail: NTIS HC $12.75 CSCL 10A

Only one resource type is presently being used to produce power in the U.S.-dry steam generating 400 MWe at the Geysers near Santa Rosa, California. Six other types are potentially available for economic energy recovery. The program plan calls for a government budgetary obligation of $40 million during FY-75 coupled with an industrial commitment of $11.7 million. The five year budgetary obligations are estimated to be $185 million for the government and $60 million for industry. The complete five year plan plus the balance-to-complete funds is presented. Author (NSA)

N74-33495# Atomic Energy Commission, Washington, D.C.
ADVANCED METHODS OF OIL AND GAS PRODUCTION FROM FOSSIL FUELS Subpanel Report 7 used in Preparing the AEC Chairmans Report to the President
E. H. Fleming 13 Nov. 1973 138 p
(WASH-1281-7) Avail: NTIS HC $9.50

Four subprograms and objectives for in situ coal gasification and recovery of oil and gas from tar sands and heavy oils are: (1) oil recovery from fluid injection, demonstrating optimum applications of existing and improved methods for some 60 billion barrels now technologically but not economically recoverable, and an additional 60 billion barrels not now technologically recoverable; (2) oil and gas from stimulating tight formations using nuclear explosives, large volume hydraulic fractures, and chemical explosives; (3) oil from oil shale by developing appropriate fracturing techniques and processing methods; and (4) oil and gas from advanced drilling technology. The predicted results of the contribution of each subprogram to production levels by 1985 and 1995 are presented, and the comparative roles of government and industry are briefly discussed. NSA

N74-33496# Atomic Energy Commission, Washington, D.C.
END-USE ENERGY CONSERVATION
J. H. Gibbons 27 Oct. 1973 226 p
(WASH-1281-12) Avail: NTIS HC $14.50

Opportunities for effective convervation of energy in the end-use sectors are considered. Major increases in efficiency can be attained through improvement of end-use technologies, better materials resource management, substitution of time and materials for energy, and alteration of lifestyles. In developing the program, end-use was divided into three main sectors (transportation, buildings, and industry) in order to inventory the opportunities for saving energy and to define mechanisms for allocating R and D resources. For technical reasons two more research sectors were added (integrated utility systems, and cross-sectoral studies). Additional factors that must be considered in determining research priorities include growth rate, role of federal versus private resources, and the extent of research opportunities. The minimum program developed by the panel is estimated to ensure a 15% savings before 2000. (LMT) NSA

N74-33497# Atomic Energy Commission, Washington, D.C.
ENERGY SYSTEMS ANALYSIS
S. Gage 27 Oct. 1973 184 p
(WASH-1281-16) Avail: NTIS HC $12.25 CSCL 10A

The establishment of those mechanisms in the Federal Government is considered that would provide for both ongoing planning and management functions based on comprehensive energy systems analyses and research programs to provide the fundamental knowledge and tools required for those analyses. Specifically, it is recommended that the energy system analysis be composed of the following five elements: (1) energy data base and system modeling; (2) technology assessment of emerging energy systems; (3) social technologies and energy systems; (4) systematic analysis of alternative energy futures; and (5) strategic management and evaluation of energy R and D programs.
Author (NSA)

N74-33498# California Univ., Livermore. Lawrence Livermore Lab.
GUIDE FOR CALCULATING COLLECTION EFFICIENCY FOR THE SHALLOW SOLAR POND (APPLICABLE FOR ANY HORIZONTAL FLAT PLATE SOLAR COLLECTOR)

W. C. Dickinson and R. D. Neifert 1 Feb. 1974 44 p refs (Contract W-7405-eng-48)
(UCID-16446) Avail: NTIS HC $4.25

The collection efficiency of a solar collector system was calculated by a method of Hottel and Whillier and Liu and Jordan. The method calculates the hourly rate of energy collection and the long term on monthly average collection efficiency based upon monthly average daily solar insolation data and daytime temperatures obtained from Weather Bureau data. The method provides the most realistic values of collection efficiency that can be obtained for a given collector system in a given location. Not only is the monthly variation taken into account but also the statistical effect of bad weather. A computer program was written to calculate average hourly values of collected heat and average daily values of collection efficiency. NSA

N74-33499# Oak Ridge National Lab., Tenn.
NATURE OF DEMAND GROWTH AND IMPLICATIONS FOR ENERGY CONSERVATION
G. S. Gill 1974 11 p refs Presented at Conf. on Energy Conservation Res., Warrenton, Va., 18-20 Feb. 1974 Sponsored by AEC and NSF
(Conf-740214-1) Avail: NTIS HC $3.00

The demand for electricity in the United States has been consistently growing at 7% per year for most of the post World War II years. If this trend were to persist, the demand for electricity in the year 2000 would be six times the 1970 level. This growth presents two major problems: the potential gaps between the supply of and demand for electricity and the growing stress on the quality of the environment. Research has accordingly been directed towards developing a methodology for an enhanced understanding of the nature of demand growth. Both constant and variable elasticity models provide useful information to the policy makers, public utilities, regulatory agencies, citizens groups, and scientific community for effectively dealing with the present and potential problems. Author (NSA)

N74-33500# California Univ., Livermore. Lawrence Livermore Lab.
SURFACE REQUIREMENTS FOR ELECTROSTATIC DIRECT ENERGY CONVERTERS
R. W. Moir, W. L. Barr, and G. H. Miley (Ill. Univ.) 17 Jan. 1974 18 p refs Presented at the Surface effects in controlled Thermonucl. Fusion Devices and Reactors Meeting, Argonne, Ill., 10-11 Jan. 1974 Sponsored by AEC
(UCRL-75323; Conf-740104-14) Avail: NTIS HC $3.00 CSCL 10A

There are two major electrostatic direct energy converter concepts which are discussed from the point of view of the surfaces. One is the Venetian blind concept and the other is the periodic electrostatic focusing concept. They are both of the direct collector type. Fluxes of D(+), T(+), He(++), electrons, and X rays are given. Design consideration due to thermionic emission, secondary electron emission, and radiation cooling are discussed. A detailed discussion is devoted to breakdown physics, the voltages and electric field strengths that can be employed, and how surface deterioration may affect voltage holding due to He(++) bombardment blistering. Author (NSA)

N74-33501# Naval Nuclear Power Unit, Fort Belvoir, Va.
OPERATING REPORT FOR RADIOISOTOPIC POWER GENERATORS OF THE US NAVY, VOLUME 7, NO. 2 Report for 1 Apr. - 31 Dec. 1973
31 Dec. 1973 85 p
(AD-781261) Avail: NTIS CSCL 18/14

The objective of the report is to serve as a vehicle for the accumulation and dissemination of information concerning the application and operation of radioisotopic power generators (RPGs) within the Navy. It will be noted that all RPGs presently listed are radioisotope thermoelectric generators (RTGs). Unless specifically identified as an engineering evaluation, items contained in this report are presented as an impartial collection of facts, observations and other information. The East Coast RPG Surveillance Facility (SURFAC) located at the Naval Nuclear Power Unit, Fort Belvoir, was placed operational on 1 June 1973. Three Sentinel 25-D's were placed operational on a tower operated by the Naval Coastal Systems Laboratory of the coast of Panama City, Florida. Three Sentinel 25-E's were recovered from the Amchitka Island, Alaska area and turned over to the U.S. Navy by the AEC. The AEC turned over the development SNAP-23A to the U.S. Navy. Eight Gulf one-watt RPG's were procured by the U.S. Navy. Author (GRA)

N74-33502# Stanford Research Inst., Menlo Park, Calif.
ASSESSMENT OF TOTAL ENERGY SYSTEMS FOR THE DEPARTMENT OF DEFENSE. VOLUME 2: APPENDICES Final Report
Richard L. Goen, Gordon Stout, L. O. Beaulaurier, Richard A. Schmidt, and John W. Ryan Nov. 1973 155 p refs
(Contract DACA23-73-C-0014)
(AD-781817; SRI-EGU-2513-Vol-2) Avail: NTIS CSCL 10/1

The purpose of the study is to assess the potential applicability of various types of total energy systems to military installations. The appendix volume of the final report contains (1) engineering performance characteristics and costs of fossil fuel system elements, (2) energy consumption data for military bases and derivation of the energy load profiles used in the study, (3) description of the fuel consumption model and summaries of the fuel consumption and total system costs for the various cases, (4) characteristics and costs of geothermal systems, and (5) description of solar energy systems. Author (GRA)

N74-33503# Stanford Research Inst., Menlo Park, Calif.
ASSESSMENT OF TOTAL ENERGY SYSTEMS FOR THE DEPARTMENT OF DEFENSE, VOLUME 1 Final Report
Richard L. Goen Nov. 1973 115 p refs
(Contract DACA23-73-C-0014; ARPA Order 2408)
(AD-781816; SRI-EGU-2513-Vol-1) Avail: NTIS CSCL 10/1

The purpose of the study is to assess the potential applicability of various types of total energy systems to military installations. The types of energy systems considered include diesel, gas turbine, steam turbine, geothermal, solar, nuclear, and solid wastes. Fuel savings are given for each type of system, and their costs are compared with the costs of conventional systems. The two most promising systems are (1) solar energy applied to heating and cooling, and (2) nuclear power. Author (GRA)

N74-33504# Atlantic Research Corp., Alexandria, Va.
A RATIONAL ENERGY POLICY
Coleman Raphael Apr. 1974 46 p refs
(PB-231913/5; ARC-P1-1) Avail: NTIS HC $3.25 CSCL 10A

The overall energy problem is analyzed by defining the crisis, its causes, and the alternative solutions which are available. Conclusions drawn throughout the report are then brought together to form a rational and cohesive recommended program. GRA

N74-33505# Federal Power Commission, Washington, D.C. Bureau of Power.
STAFF REPORT ON WIND POWER
Sep. 1973 13 p
(PB-231955/6) Avail: NTIS HC $3.00 CSCL 10B

The ten page pamphlet states that while there is a genuine interest on the part of all electric utilities today in economical and non-polluting sources of electric power, the practical potential for windpower devices is at present limited, and reasonable solutions for space requirements and land use problems have not yet been developed. GRA

N74-33506# Army Foreign Science and Technology Center, Charlottesville, Va.
MACROKINETIC PROCESSES IN POROUS MEDIA FUEL CELLS
Yu. A. Chizmadzhev, V. S. Martin, M. R. Tarasevich, and Yu. G. Chirkov 8 May 1974 589 p refs Transl. into ENGLISH from an unidentified RUSSIAN book Moscow, Nauka Press, 1971 364 p
(AD-781204; FSTC-HT-23-1566-73) Avail: NTIS CSCL 10/2

The book deals with macrokinetic processes in porous media, particularly in porous catalysts of fuel cells. It presents a detailed exposure of the theory of porous gas-diffusion electrodes and investigates capillary phenomena in porous media, hydrodynamic mixing and related processes. GRA

N74-33507# Army Foreign Science and Technology Center, Charlottesville, Va.

ISSUES IN HIGH-POWER CRYOGENIC TURBOGENERATOR DESIGNING
V. V. Dombrovskii, N. N. Anempodistova, and L. P. Aleksandrova 1 Apr. 1974 21 p refs Transl. into ENGLISH of the book "Vysokoispol. Turbo. i Gidrogen. s Neprosred. Okhlazhen." Leningrad, Nauka Press, 1971 p 3-17
(AD-781190; FSTC-HT-23-1691-73) Avail: NTIS CSCL 10/2

Problems in designing high-power electric machines with low-temperature cooling of windings made of superconducting and pure metals are discussed. The project for a 1600 Mw turbogenerator with superconducting rotor and stator winding made of beryllium and operating at 77K is used as the design illustration. GRA

N74-33508# General Electric Co., Philadelphia, Pa. Space Div.
ELECTRODE STUDIES AND RECENT RESULTS OF NON-EQUILIBRIUM MHD GENERATOR EXPERIMENTS
Bert Zauderer, Eric Tate, and Charles H. Marston May 1974 8 p refs
(Contract N00014-73-C-0039)
(AD-781744; Doc-74SD217; TR-21) Avail: NTIS CSCL 10/2

Experimental studies of comparative performance of 3 basic low temperature electrode designs were done in a Mach 5 MHD flow. Protruding wire electrodes parallel to the B field direction were distinctly superior to flush electrodes and to wires protruding in the E-field direction. The high Mach number channel is especially suited to the study of strong electromagnetic interaction in nonequilibrium generators. Preliminary results are reported.
Author (GRA)

N74-33509# Army Foreign Science and Technology Center, Charlottesville, Va.
ON OPTIMIZING SUPPLY CONDITIONS FOR HIGH POWER PULSE INSTALLATIONS
K. V. Bulgakov and V. B. Freiman 10 Mar. 1974 8 p refs Transl. into ENGLISH from Izv. Elektrotekhn. Inst. (Leningrad), no. 86, 1970
(AD-781532; FSTC-HT-23-1013-73) Avail: NTIS CSCL 10/2

The problem of determining the economically optimal power supply configuration for a high power pulse generator is considered. Two basic designs are discussed; one employing a current regulated converter and a simpler design which uses no stage between the generator and the pulse shaper. The merits of each are theoretically evaluated in light of short term and long term economic considerations. GRA

N74-33510# Wayne State Univ., Detroit, Mich. Dept. of Chemistry.
PROPERTIES OF ENERGETIC IONS TRAPPED IN SOLIDS OF INTEREST AS FUTURE ENERGY SOURCES Final Report, 1 Oct. 1969 - 30 Sep. 1973
Larry Kevan Dec. 1973 31 p
(Grant AF-AFOSR-1852-70; AF Proj. 9750)
(AD-780613; AFOSR-74-0800TR) Avail: NTIS CSCL 07/5

This is a final report of research designed to extend the knowledge of production, storage and utilization of highly energetic chemical species. The research concentrated on the physical and chemical properties of radiation-produced ions trapped in solid matrices. The first definitive and comprehensive picture of trapped electron energy levels in glassy matrices extending over a broad range of polarity has been obtained from both experimental and theoretical studies. Mobility measurements of electrons in conduction states of glassy matrices have allowed the identification of the dominant electron scattering mechanisms. New methods involving electron-electron double resonance have been developed to study magnetic energy transfer between ions and radicals in disordered solids. The spatial correlation between cations and electrons produced by photoionization has been demonstrated to depend upon the photoionization energy. These studies lay the groundwork for characterizing the stability of ion trapping in disordered solids. Included are abstracts of 34 papers completed on this project. (Modified author abstract) GRA

N74-33511# American Cyanamid Co., Stamford, Conn. Chemical Research Div.
RESEARCH ON CADMIUM STANNATE SELECTIVE OPTICAL FILMS FOR SOLAR ENERGY APPLICATIONS Quarterly Progress Report, 1 Jan. - 31 Mar. 1974
G. Haacke 31 Mar. 1974 43 p refs
(Grant NSF GI-39539)
(PB-232883/9; NSF-RA/N-74-031; NSF-RANN/SE/GI-39539/PR/74-1; QPR-1) Avail: NTIS HC $3.25 CSCL 10B

The development of transparent, electically conductive cadmium stannate (Cd2SnO2) coatings and their incorporation into solar energy conversion devices are reported. The optical properties of Cd2SnO4 films will be determined and the use of these films evaluated as coatings for flat plate collectors covers. GRA

N74-33512# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
APPLIED RESEARCH ON II-VI COMPOUND MATERIALS FOR HETEROJUNCTION SOLAR CELLS Interim Quarterly Progress Report, 1 Feb. - 21 Mar. 1974
Richard H. Bube, Alan L. Fahrenbruch, Fredrik Buch, Kim Mitchell, and Valery Vasilchenko 15 Apr. 1974 25 p refs
(Grant NSF GI-38445)
(PB-232884/7; NSF-RA/N-74-030; NSF-RANN/SE/GI-38445X/PR-74-1) Avail: NTIS HC $3.00 CSCL 10B

Research aimed at developing large-area cells for terrestrial applications considered: (1) properties of high resistivity i-layers occurring near the junction interface between the CdS and the CdT; (2) thermoelectric power measurements to investigate the electrical transport properties of CdTe films deposited by vapor transport; (3) The effect of thermally etching the CdS substrates on the epitaxy of CdTe films; and (4) H2 anneals to convert high resistivity evaporated CdS films to low restivity films. Films crystal cells with solar efficiencies of up to 5.2%, open circuit voltages up to 0.66 V in sunlight, and fill factors of 49% have been produced. GRA

N74-33513# Naval Postgraduate School, Monterey, Calif.
ON THE SUPPLY AND DEMAND FOR ENERGY M.S. Thesis
Fariborz Golshani Javadi Jun. 1974 83 p refs
(AD-782322) Avail: NTIS CSCL 10/1

A review of the world energy consumption is given and it is shown that there is a strong relationship between economic growth and energy consumption. A comprehensive analytical model capable of evaluating the impact of energy related decisions is developed. The model is descriptive of exploration, extraction, storage, import, and processing of energy resources and takes into account the relationship between these aspects of energy production and the market prices of energy resources. GRA

N74-33514# Aerospace Corp., El Segundo, Calif. Civil Programs Div.
SOLAR THERMAL CONVERSION MISSION ANALYSIS. VOLUME 1: SUMMARY REPORT
15 Jan. 1974 230 p refs
(Contract NSF C-797)
(PB-232668/4; ATR-74(7417-05)-1-Vol-1; NSF-RA/N-74-017-Vol-1) Avail: NTIS HC $6.00 HC also available from NTIS $18.00/set of 5 reports as PB-232667-SET CSCL 10B

Principal interim results of solar thermal conversion mission analysis are primarily methodological and intended to provide an analytical procedure that will consistently evaluate alternative solar thermal conversion concepts in a variety of realistic operating environments. Various sections summarize demand, insolation, margin, mission/system, economic, siting, and environmental methodologies and analyses developed under initial six month contract. More details are described in four additional volumes. Technical and economic results are preliminary and serve primarily to illustrate the potential capabilities of the methodology itself. (Modified author abstract) GRA

N74-33515# Aerospace Corp., El Segundo, Calif. Civil Programs Div.
SOLAR THERMAL CONVERSION MISSION ANALYSIS. VOLUME 2: DEMAND ANALYSIS
15 Jan. 1974 61 p refs
(Contract NSF C-797)

(PB-232669/2; ATR-74(7417-05)-1-Vol-2;
NSF-RA/N-74-017A-Vol-2) Avail: NTIS HC $3.75 HC also available from NTIS $18.00/set of 5 reports as PB-232667-SET CSCL 10B

A methodology is reported that is capable of characterizing future electric power demand data and to forecast Southern California hourly electric power demand for the years 1980-2000. Forecasts of demand data exhibiting cyclic variations consistent with observed behavior patterns are necessary inputs to the solar thermal conversion system simulation. Background information, technical reports and raw data were acquired from governmental agencies and utilities throughout the country and particularly Southern California. A demand model was postulated to include factors describing a growth trend, weather conditions, seasonal influences, and hourly cyclic variations. A correlation between demand and weather, or insolation factors was investigated. GRA

N74-33516# Aerospace Corp., El Segundo, Calif. Civil Programs Div.

SOLAR THERMAL CONVERSION MISSION ANALYSIS. VOLUME 3: SOUTHERN CALIFORNIA ISOLATION CLIMATOLOGY

15 Jan. 1974 119 p refs
(Contract NSF C-797)
(PB-232670/0; ATR-74(7417-05)-1-Vol-3;
NSF-RA/N-74-017B-Vol-3) Avail: NTIS HC $4.50 HC also available from NTIS $18.00/set of 5 reports as PB-232667-SET CSCL 10B

An insolation data base consisting of hourly values of normal incidence (direct) insolation and total insolation for a two year period has been prepared in computer-compatible format for eight stations characterizing Southern California and for Albuquerque, New Mexico. The data base includes, in addition to the insolation data, solar position information and weather information. Statistical studies were performed on these data, including a comparison of insolation at various stations, a percentile frequency analysis of insolation values and a temperature insolation correlation analysis. A literature survey of the information available about the distribution of sky brightness was made. The procedures used and the results of these various studies are discussed in detail. GRA

N74-33517# Aerospace Corp., El Segundo, Calif. Civil Programs Div.

SOLAR THERMAL CONVERSION MISSION ANALYSIS. VOLUME 4: MISSION/SYSTEM AND ECONOMIC ANALYSIS

15 Jan. 1974 158 p refs
(Contract NSF C-797)
(PB-232671/8; ATR-74(7417-05)-1-Vol-4;
NSF-RA/N-74-017C-Vol-4) Avail: NTIS HC $5.00 HC also available from NTIS $18.00/set of 5 reports as PB-232667-SET CSCL 10B

The mission/systems and economic analyses performed to examine the dynamic interaction of insolation, demand, and solar power systems are described. A methodology was developed, using the hourly demand projections and regional insolation data already obtained, to parametrically assess the performance characteristics of alternative solar thermal conversion missions and systems in realistic operating environments on a consistent basis. A comparative economic evaluation of these alternative power plant concepts with conventional power plants is possible once the technical performance of solar power plants have been parametrically determined for different modes of operation. GRA

N74-33518# Aerospace Corp., El Segundo, Calif. Civil Programs Div.

SOLAR THERMAL CONVERSION MISSION ANALYSIS. VOLUME 5: AREA DEFINITION AND SITING ANALYSIS

15 Jan. 1974 77 p refs
(Contract NSF C-797)
(PB-232672/6; ATR-74(7417-05)-1-Vol-5;
NSF-RA/N-74-017D-Vol-5) Avail: NTIS HC $4.00 HC also available from NTIS $18.00/set of 5 reports as PB-232667-SET CSCL 10B

The results are presented of an area definition and siting analysis which was conducted to define and characterize Southern California study region, and to identify the area within the region judged to be potentially suitable for siting solar power plants. Boundaries were chose to conform to state boundaries on the west, south, and east and with limits of the Southern California Edison Company service territory on the north. This region contains a wide variety of climatological and geological conditions and is served by three major electrical utilities - Southern California Edison Company, Los Angeles Department of Water and Power, and San Diego Gas and Electric Company. Between 5,000 and 15,000 square miles out of a total of 67,000 square miles were found to be potentially suitable for siting large, central-station solar power plants. GRA

N74-33519# British Steel Corp., Sheffield (England). Information Services.

FUEL ENERGY AND THE STEEL INDUSTRY: A BIBLIOGRAPHY

D. G. Brinn Apr. 1974 20 p refs
(PB-232236/0; SM/TN/1/35) Avail: NTIS HC $4.00 CSCL 10A

The bibliography, which consists of 74 annotated references, has been organized under the following headings: (1) the overall energy situation; (2) the energy situation and the steel industry; (3) fuel and energy management in the steel industry; (4) reports of fuel and energy savings in steel industry; (5) the coal situation; (6) electricity supplies; (7) oil and gas; and (8) steelmaking and nuclear energy. GRA

N74-33520# Consolidation Coal Co., Library, Pa. Research Div.

PRODUCTION OF CLEAN FUEL GAS FROM BITUMINOUS COAL Final Report

G. Curran, J. Clancey, B. Pasek, and M. Pell Dec. 1973 241 p refs
(Contract EPA-EHSD-71-15)
(PB-232695/7; EPA-650/2-73-049) Avail: NTIS HC $6.00 CSCL 07A

A process for the production of low-Btu gas from bituminous coals via fluid bed gasification is described. Coal processing consists of pretreatment, gasification, and final burnup. Hot fuel gas is desulfurized with half calcined dolomite and cleaned of particulates in high pressure drop cyclones. The sulfur acceptor is regenerated with steam and CO2. A liquid phase Claus reactor is used to process the H2S in the regenerator offgas into elemental sulfur. Experimental data are presented which demonstrated feasibility of the major process steps. The cost of the gas desulfurization process including sorbent regeneration and sulfur recovery is of the order of 20 cents/MM Btu of product gas. (Modified author abstract) GRA

N74-33521# Dow Chemical Co., Walnut Creek, Calif.

RESEARCH AND DEVELOPMENT ON THE GLASS FIBER SODIUM-SULPHUR BATTERY Semiannual Technical Report

Charles A. Levine 1 May 1974 37 p
(Contract DAHC15-73-C-0254)
(AD-782059) Avail: NTIS CSCL 10/3

Development is proceeding on a high energy density sodium-sulfur secondary battery which uses the walls of fine hollow glass fibers as the electrolyte-separator. Use of thousands of these hollow glass fibers, bundled together in parallel and filled with sodium as the anolyte, results in a cell that has a very high energy per unit weight at a high power per unit weight. The authors are trying to make multi-fiber cells capable of at least 1000 cycles of charge-discharge, to build larger cells capable of long lifetimes, to scale up to a 5 ampere-hour cell, to continue development of a 40 ampere-hour cell, to determine operating parameters at different charge-discharge rates, and to determine construction details necessary for thermal cycling. GRA

N74-33522# Nebraska Univ., Lincoln. Water Resources Research Inst.

THE ROLE OF WATER IN THE ENERGY CRISIS

Oct. 1973 221 p refs Conf. held at Lincoln, Neb., 23-24 Oct. 1973 Sponsored by Dept. of Interior
(PB-232404/4; W74-07961; QWRR-A-999-NEB(13)) Avail: NTIS HC $5.75 CSCL 10A

Ways that the water resources community could help solve

national and regional energy problems are presented. Topics discussed include energy-water relationship (economic, environmental, political-social, and technological), the role of water resources in the energy crisis, regional energy problems, and an assessment of research needs. GRA

N74-33523# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
INVESTIGATION OF ORGANIC SEMICONDUCTOR FOR PHOTOVOLTAIC APPLICATION Final Report, 1 Jul. 1970 - 31 Dec. 1973
Pao-Hsein Fang 1 Apr. 1974 44 p refs
(Contract F19628-71-C-0093; AF Proj. 8659)
(AD-781926; AFCRL-TR-74-0192) Avail: NTIS CSCL 10/2

The work is oriented toward five areas: (1) measurement of the photovoltaic conversion efficiency as a solar cell, (2) analysis of the spectral response of the quantum yield, (3) analysis of the transient response with a pulsed light source, (4) model analysis of the configuration of the organic semiconductor solar cell and (5) the aging phenomenon of tetracene solar cells. The work in areas (1) to (4) is completed together with physical interpretations. Area (5), which requires measurements over an extended period of time, but is of fundamental importance from the point of view of practical application, has not been able to be completed before the termination of the present contract, and a stage of physical interpretation has not been reached. Author (GRA)

N74-33524# EIC, Inc., Newton, Mass.
SULFUR-BASED LITHIUM-ORGANIC ELECTROLYTE SECONDARY BATTERIES Quarterly Report, 3 Dec. 1973 - 3 Mar. 1974
Gerhard L. Holleck, S. Barry Brummer, Michael D. Oliker, Clarence B. Ross, and Fred S. Shuker May 1974 41 p refs
(Contract DAAB07-74-C-0072; DA Proj. 1T0-61102-A-34A)
(AD-782241; C-405-1; ECOM-0072-1-74) Avail: NTIS CSCL 10/3

The program is aimed at developing a rechargeable organic-electrolyte lithium battery to operate over the range -40 to +160F, have an energy density approaching 100 Whr/lb, a cycle life in excess of 500, and high charge retention. The approach is to use positive electrodes based on sulfur. Two parallel tasks are being carried out: Development of a soluble sulfur positive and of positives based on higher sulfides of transition metals, particularly of titanium and vanadium. Investigations have begun of the solubility of sulfur and lithium polysulfides in propylene carbonate, LiAlCl4 solutions and of the catalysis of their reduction. Studies were made with Ag, Au, C, and Pt electrodes. Niobium sulfide active material has been formed both electro-chemically and thermally. Charging was carried out in propylene carbonate solutions containing Na2S. (Modified author abstract) GRA

N74-33525# Army Foreign Science and Technology Center, Charlottesville, Va.
ELECTRIC CIRCUIT CALCULATIONS FOR MULTISTAGE SOLAR THERMOELECTRIC GENERATORS
B. Arazmedov, Ch. Agabaev, Yu. N. Malevskii, B. M. Berdyev, and O. Annaev 1 Apr. 1974 9 p refs Transl. into ENGLISH from Geliotekhnika (USSR), no. 2, 1972 p 13-16
(AD-782041; FSTC-HT-23-1591-73) Avail: NTIS CSCL 10/2

A method of calculating the electric circuit of a multistage solar thermoelectric generator is described for the case when all thermopile-stage functions are in appropriate working conditions and are series-connected into the external load circuit. GRA

N74-33526# Assistant Secretary of Defense (Installations and Logistics), Washington, D.C.
MANAGEMENT OF DEFENSE ENERGY RESOURCES: REPORT OF THE DEFENSE ENERGY TASK GROUP
15 Nov. 1973 210 p refs
(AD-782268) Avail: NTIS CSCL 10/1

Energy-related problems facing the Department of Defense are investigated and 57 recommendations for strengthening the management of DOD energy resources are given. Topic areas covered include: World and U. S. energy outlook; Defense energy requirements and budget impact; petroleum storage and distribution; fuels standardization; naval petroleum reserves; Defense energy conservation: energy-related R and D; and energy organization and management in DOD. GRA

N74-34415 National Aeronautical Establishment, Ottawa (Ontario). Low Speed Aerodynamics Lab.
WIND POWER AND THE VERTICAL AXIS WIND TURBINE DEVELOPED AT THE NATIONAL RESEARCH COUNCIL
R. S. Rangi, P. South, and R. J. Templin *In* NRS Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 30 Jun. 1974 p 1-14 refs (For availability see N74-34414 23-34)

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N74-33527*# Delaware State Coll., Dover. Dept. of Biology.
THE RAPID QUANTITATION OF THE FILAMENTOUS BLUE-GREEN ALGA PLECTONEMA BORYANUM BY THE LUCIFERASE ASSAY FOR ATP
Valerie N. Bush Mar. 1974 20 p refs
(Grant NGR-08-002-003)
(NASA-CR-140486) Avail: NTIS HC $4.00 CSCL 06C

Plectonema boryanum is a filamentous blue green alga. Blue green algae have a procaryotic cellular organization similar to bacteria, but are usually obligate photoautotrophs, obtaining their carbon and energy from photosynthetic mechanism similar to higher plants. This research deals with a comparison of three methods of quantitating filamentous populations: microscopic cell counts, the luciferase assay for ATP and optical density measurements. Author

N74-33528*# Colorado State Univ., Fort Collins.
[RESEARCH ON INERT GAS NARCOSIS AND AIR VELOCITY EFFECTS ON METABOLIC PERFORMANCE] Semiannual Status Report, Nov. 1973 - 30 Apr. 1974
30 Apr. 1974 61 p refs
(Grant NGR-06-002-075)
(NASA-CR-140065) Avail: NTIS HC $6.25 CSCL 06P

The effects of air velocity on metabolic performance are studied by using high forced airflow in a closed environment as a mechanism to control the concentration of volatile animal wastes. Air velocities between 100 and 200 ft/min are without significant effects on the metabolism of rats. At velocities of 200 ft/min and above, oxygen consumption and CO2 production as well as food consumption increase. In most instances, the changes are on the order of 5-10%. At the same time, the RQ for the animals increases slightly and generally correlates well with oxygen consumption and CO2 production. Experiments on the nature of inert gas narcosis show that halothane and methoxyflurane are rather potent inhibitors of the NADH:O2 oxidoreductase system in rats. These experiments suggest that the mechanism of inert gas narcosis is not mandatorily related to a membrane surface phenomenon. Author

N74-33529*# Grambling Coll., La. Dept. of Physics.
THE EFFECT OF CONTINUOUS LOW DOSE-RATE GAMMA IRRADIATION ON CELL POPULATION KINETICS OF LYMPHOID TISSUE Final Report
Bessie R. Foster 4 Oct. 1974 35 p refs
(Grant NGR-19-011-008)
(NASA-CR-140114) Avail: NTIS HC $4.75 CSCL 06R

Cellular response and cell population kinetics were studied during lymphopoiesis in the thymus of the mouse under continuous gamma irradiation using autoradiographic techniques and specific labeling with tritiated thymidine. On the basis of tissue weights, it is concluded that the response of both the thymus and spleen to continuous low dose-rate irradiation is multiphasic. That is, alternating periods of steady state growth, followed by collapse, which in turn is followed by another period of homeostasis. Since there are two populations of lymphocytes - short lived and long-lived, it may be that different phases of steady state growth are mediated by different lymphocytes. The spleen is affected to a greater extent with shorter periods of steady-state growth than exhibited by the thymus. Author

N74-33530*# Pennsylvania Univ., Philadelphia. Dept. of Biology.
RESEARCH ON GRAVITATIONAL PHYSIOLOGY Technical Status Report, 1 Mar. - 31 Aug. 1974
Allan H. Brown and A. Orville Dahl 31 Aug. 1974 20 p refs (Grants NGR-39-010-149)
(NASA-CR-139691) Avail: NTIS HC $4.00 CSCL 06C

The topic of gravitational plant physiology was studied through aspects of plant development (in ARABIDOPSIS) and of behavior (in HELIANTHUS) as these were affected by altered g experience. The effect of increased g levels on stem polarity (in COLEUS) was also examined. Author

N74-33531*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PROCEEDINGS OF THE 1972 LYNDON B. JOHNSON SPACE CENTER ENDOCRINE PROGRAM CONFERENCE
Sep. 1974 113 p refs Conf. held at Houston, Tex., Nov. 1972
(NASA-TM-X-58134; JSC-09046) Avail: NTIS HC $4.50 CSCL 06P

Subjects covered during the Endocrine Program Conference include the following: (1) endocrine/metabolic studies on the Apollo 16 crewmen; (2) changes in glucose, insulin, and growth hormone levels associated with bed rest; (3) circadian rhythms of heart rate and body temperature during 56 days of bed rest; (4) stress-induced changes in corticosteroid metabolism in man; (5) present status of physiological studies on parathyroid hormone and vitamin D; (6) antagonistic effect of lithium on antidiuretic hormone action; (7) proposed Skylab body-fluid volumes study; (8) daily rhythmic changes in serotonin content in areas of the mouse brain and norepinephrine content in areas of the hamster brain; (9) studies of sodium homeostasis during simulated weightlessness; and (10) application of the water immersion model to man. Author

N74-33532*# Kanner (Leo) Associates, Redwood City, Calif.
CEREBRAL BLOOD CIRCULATION INVESTIGATIONS ABOARD SOYUZ 13 -- SALYUT 3
I. Kasyan and Kh. Asanov Washington NASA Sep. 1974 5 p Transl. into ENGLISH from Med. Gaz. (USSR), 2 Aug. 1974 p 3
(Contract NASw-2481)
(NASA-TT-F-15987) Avail: NTIS HC $4.00 CSCL 06S

Studies conducted during the Soyuz 13 flight dealing with cerebral blood flow in crew members F. Popovich and Yu. Artyukhin aboard the Salyut 3 space station are described. A Levkoy two channel rheoplethysmograph was used to record and transmit rheograms and electroplethysmograms to earth through the spacecraft's telemetric system. Author

N74-33533*# Kanner (Leo) Associates, Redwood City, Calif.
BIOLOGICAL RESEARCH IN SPACE: SOME CONCLUSIONS AND PROSPECTS
O. G. Gazenko, Ye. A. Ilin, and G. P. Parfenov Washington NASA Sep. 1974 29 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (USSR), no. 4, Jul. - Aug. 1974 p 461-475
(Contract NASw-2481)
(NASA-TT-F-15961) Avail: NTIS HC $4.50 CSCL 06C

The main Soviet biomedical experiments conducted since the beginning of space flight are reviewed; on the basic of their results, it is concluded that prolonged manned space flight is possible, although certain apparently reversible changes in vital processes have been noted. The experiments are divided into four groups: research on mammals and turtles, on insects and amphibians, on plants, and on microorganisms and tissue cultures. In these experiments, the genetic effect of cosmic ionizing radiation and other factors of space environment, and the effect of weightlessness are stressed. Author

N74-33534# Advisory Group for Aerospace Research and Development, Paris (France).
THE PHYSIOLOGY OF COLD WEATHER SURVIVAL
A. Borg, ed. (Roy. Norweg. Air Force) and J. H. Veghte, ed. (AMRL, Wright-Patterson AFB, Ohio) Jun. 1974 99 p refs (AGARD-R-620) Avail: NTIS HC $8.00

Physiological factors and emergency life sustaining measures are outlined for aircrew survival in a cold winter region. For individual titles, see N74-33535 through N74-33545.

N74-33535 Oslo Univ. (Norway).
THERMOGENETIC MECHANISMS INVOLVED IN MAN'S FITNESS TO RESIST COLD EXPOSURE
K. Lange Anderson *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 1-6 refs (For availability see N74-33534 23-04)

The main factor by which man's fitness to resist cold exposure can be varied, appears to be thermogenesis. The biological variation of BMR, shivering, a possible non-shivering thermogenesis, and the maximal aerobic power is reviewed. BMR of an individual can vary with diet, general health, habitual physical activity, as well as various environmental conditions, conceivably including cold exposure. A definite inter- and intra-individual variation in shivering threshold exists. Man's capability to raise his metabolism in muscular exercise is an important part of his fitness to resist cold exposure. This capability can be assessed by measurement of maximal oxygen uptake. Maximal oxygen uptake is influenced by age, sex, health, diet and habitual physical activity. Author

N74-33536 Oslo Univ. (Norway).
PERIPHERAL CIRCULATORY ADJUSTMENT TO COLD
John Krog *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 7-15 refs (For availability see N74-33534 23-04)

Measurements of blood circulation in the hands and faces of Arctic people are compared with those on Norwegian lumberjacks and city dwellers. Obtained data for time of onset of vasodilation, amount of vasodilation, and pressure response following cold stimulation indicate that the greater tolerance to cold in Arctic people is due to an adjustment of the vasomotor control in the pheripheral tissue, in such a way that the initial vasoconstriction response is less severe and lasts shorter. G.G.

N74-33537 Royal Norwegian Air Force, Oslo.
INTRODUCTION TO WINTER SURVIVAL
Rolf A. Grimsrud and Claus Moelbach-Thellessen *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 17-28 (For availability see N74-33534 23-04)

In winter man cannot stay in the open and expect to live unless he is on the move. He needs a shelter of some kind even if it is only a hole in the snow. It should be kept in mind that a wind of 10 knots equals a fall in temperature of approximately 30 deg celsius on the skin compared with that experienced in quiet weather. The type of shelter to be built will depend on: (1) tools and material available; (2) snow conditions; and (3) the length of time of expected residence in that particular location. Aircrew must remember to adjust their clothing while working. Sweating should be avoided. Emergency signalling equipment should be readily available at all times and the camp site should be made as conspicuous as possible from the air. Author

N74-33538 Oslo Univ. (Norway).
METHODS IN CIRCULATORY RESEARCH
John Krog *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 29-39 (For availability see N74-33534 23-04)

The principles of indirect methods and direct methods for determining human peripheral circulation are discussed in connection with planning for research in aviation medicine. The former are based on body tissue temperature measurements, changes in oxygen tension, and elimination of metabolic inert substances; the latter category includes plethysmography and flow meters. G.G.

N74-33539 Oslo Univ. (Norway). Human Adaptability Section.
LOCAL EFFECTS OF ACCLIMATIZATION TO COLD IN MAN
Bjorn Hellstrom *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 41-51 refs (For availability see N74-33534 23-04)

The mechanisms underlying local manifestations of cold acclimatization are not fully known, but point to a central nervous habituation to cold exposure. This primitive type of learning is characterized by a diminishing response upon repeated stimulation.

It is common experience that the discomfort caused by cold is reduced by repeated or prolonged cold exposures. There is also ample evidence that shivering is reduced with repeated cold exposures. These reductions of physiological reactions to cold upon repeated exposures to low ambient temperatures point towards a central nervous habituation as the main mechanism of cold acclimatization in man. Author

N74-33540 Oslo Univ. (Norway). Inst. of Work Physiology.
A PHYSIOLOGICAL COMPARISON OF THE PROTECTIVE VALUE OF NYLON AND WOOL IN A COLD ENVIRONMENT c05
Kaare Rodahl, Fredric A. Giere, Peer H. Staff, and Bertil Wedin *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 53-57 refs (For availability see N74-33534 23-04)

Similar inner garments of nylon pile and of wool pile were compared in paired experiments at rest for one hour and during two hours fairly strenuous physical activity (treadmill walking at 100 m/min, 5% incline) followed by two hours rest in a climatic chamber at -20 C. Each subject served as his own control, participating in experiments using both types of experimental garments. Under these conditions no significant difference could be detected between the two types of garments in terms of thermal insulation, nor in the ability of the two types of fabric to allow free escape of moisture produced by sweating during physical activity. Author

N74-33541 Oslo Univ. (Norway). Human Adaptability Section.
VIBRATION INJURIES AND COLD EXPOSURE
Bjorn Hellstrom *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 59-67 refs (For availability see N74-33534 23-04)

The connection between cold exposure and traumatic vasospastic desease is studied on forest workers who experience vasodilation of the fingers even in a very cold climate environment. Experimental results indicate that these workers achieve an acclimatization to cold manifesting itself by a lowered central temperature threshold for cutaneous vasodilation during exercise. Cold is the main trigger of vasospastic attacks. G.G.

N74-33542 Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
COLD PHYSIOLOGIC STUDIES
James H. Veghte *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 69-76 refs (For availability see N74-33534 23-04)

A number of research studies are discussed in which human physiological responses to cold have been monitored in evaluation of insulating clothing and protective sheltering. Cold, as a stressor, can be overcome if aircrew members are educated that there is usually sufficient time in a survival situation to meet any cold stress. The importance of extremity protection, danger of CO2 or CO poisoning in snow shelters, and loss of insulation because of moisture accumulation are paramount. Author

N74-33543 Royal Naval Air Medical School, Hillhead (England).
IMMERSION HYPOTHERMIA
F. St. C. Golden *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 77-90 refs (For availability see N74-33534 23-04)

Human thermoregulation in water, and the factors affecting survival times of the immersed victim are discussed in broad detail. The physiological changes encountered in hypothermia are outlined and the associated signs and symptoms discussed. Some general advice on treatment is proposed, both from the first aid and curative standpoint. Author

N74-33544 Royal Naval Air Medical School, Hillhead (England).
AIRCREW SURVIVAL TRAINING IN THE UNITED KINGDOM AND NORTHERN NORWAY c05
W. J. Blake *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 91-93 (For availability see N74-33534 23-04)

Details of the basic survival training given to Royal Naval Aircrew in the United Kingdom are reported. The further training given in northern Norway is also covered. Author

N74-33545 Royal Norwegian Air Force, Oslo.
SNOW AVALANCHES c13
R. A. Grimsrud *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 95-96 (For availability see N74-33534 23-04)

Causes and effects of snow slides are described and human survival measures in an avalanche situation are outlined. G.G.

N74-33546# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 8, NO. 4, 1974
10 Oct. 1974 151 p refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 1-88
(JPRS-63175) Avail: NTIS HC $10.75

Long duration space flight effects on the human body and human factors engineering aspects of life support systems are considered. For individual titles, see N74-33547 through N74-33571.

N74-33547 Joint Publications Research Service, Arlington, Va.
PASSIVE HYPERPOLARIZATION ACCOMPANYING A DEFICIT OF EXCITATION
G. N. Sorokhtin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 1-10 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 3-9 (For availability see N74-33546 23-04)

Reactions of various (central and peripheral) excitable structures in response to a lack of excitation are described. Termination of the influx of excitation impulses can be caused by transections, blockades and central inhibition under physiological conditions. In all cases excitable structures in the case of a deficit of excitation exhibit passive hyperpolarization which is accompanied by decreased or increased excitability. During passive hyperpolarization, metabolism is characterized by a decreased intensity of oxidative processes and moderate metabolism rates. Author

N74-33548 Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF DISTURBANCES IN MINERAL METABOLISM IN RATS DURING PROLONGED HYPOKINESIA
A. A. Pokrovskiy, R. A. Zavalishina, and A. Menendes *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 11-17 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 10-14 (For availability see N74-33546 23-04)

Changes in mineral metabolism of rats exposed to prolonged hypodynamia were studied. Urine electrolyte excretion exhibited three phases. The first two phases were typical of two stages in the stress period. The third phase was characterized by a normal excretion of K and Mg and an increased excretion of Ca and P up to 150-170 percent by the end of the experiment. Balance studies indicated higher losses of Ca and P equilibrium remaining positive. Ca losses during hypodynamia were demonstrated by bone tissue analysis of femoral bones. Experimental rats also exhibited a significant decrease in the hydroxyproline content in the bone tissues. Author

N74-33549 Joint Publications Research Service, Arlington, Va.
SENSITIVITY OF THE ANIMAL BODY TO NARCOTICS DURING RESTRICTED MOTOR ACTIVITY
L. Ya. Kolemeyeva and V. S. Shashkov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 18-26 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 14-19 (For availability see N74-33546 23-04)

The influence of restricted motor activity on the sensitivity of the animal body to narcotics, which affect primarily different parts of the central nervous systems, was studied. These drugs are also used for a pharmacological analysis of impairments in physiological functions arising during restricted motor activity. Collected data indicate that animal reactivity to narcotic substances is dependent on the duration of restricted mobility and the spectrum of effect of the investigated drug. Author

N74-33550 Joint Publications Research Service, Arlington, Va.
NEUROSECRETION OF THE HYPOTHALAMUS AND CHANGES IN THE SUPRARENALS IN THE PROCESS OF ADAPTATION TO OXYGEN STARVATION AND DEEP HYPOTHERMIA
N. V. Korostovtseva, V. I. Bertash, and Ye. S. Sergeyeval *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 27-32 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 20-23 (For availability see N74-33546 23-04)

Experiments on Wistar rats demonstrated that a single exposure to hypoxic and hypercapnic hypothermia brought about a noticeable increase in the activity of both the central and peripheral parts of the hypothalamic-hypophyseal-suprarenal system. A hypothermal exposure applied two days later under the same conditions, when the animals exhibited an enhanced tolerance to oxygen starvation, induced less marked system responses. It is concluded that the hypothalamic-hypophyseal-suprarenal system plays the major role in the increase of animal tolerance to the above extremal conditions. Author

N74-33551 Joint Publications Research Service, Arlington, Va.
FUNCTIONAL-MORPHOLOGICAL CHANGES ACCOMPANYING INCREASING HYPOXIA AND HYPERCAPNIA
V. L. Popkov, N. G. Lakota, and G. P. Bykov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 33-38 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 24-28 (For availability see N74-33546 23-04)

In experiments with dogs it was possible to simulate three types of failure of systems for regenerating the atmosphere, leading in a manned pressurized volume to slowly increasing hypoxia, hypercapnia and their combination. A comparative description is given of the nature and rate of development of shifts in some indices of the state of the organism and morphological changes in the organs and tissues. A combination of hypercapnia and hypoxia caused earlier and deeper disturbances. Recommendations on the relative critical concentrations of oxygen and carbon dioxide for cases of failure of atmospheric regeneration systems in manned spaces must be based not only on the functional indices, but also on the expected morphological impairments. Author

N74-33552 Joint Publications Research Service, Arlington, Va.
STABILITY OF MULTIPLY COUPLED SYSTEMS WITH A SYMMETRIC STRUCTURE OF A NEUTRAL CONTROLLED OBJECT AND GROUP BEHAVIOR OF SUBJECTS IN A PSYCHOLOGICAL EXPERIMENT
V. K. Vasilyev and A. B. Savvin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 39-46 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 28-33 (For availability see N74-33546 23-04)

The asymptotic stability was studied of linear differential equations in Cauchy form, whose matrix is the product of two symmetric matrices. The property of mutual supplementation of the spectra of matrix cofactors for asymptotically stable systems is demonstrated. The results are used in a rough evaluation of algorithms of group behavior of human subjects in experiments formulated using the homeostatic method. Author

N74-33553 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF THE MECHANICAL PARAMETERS OF THE OTOLITHIC APPARATUS AND ITS ANATOMIC CHARACTERISTICS
V. N. Krutko *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 47-54 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 33-38 (For availability see N74-33546 23-04)

Expressions have been derived to correlate mechanical parameters of the otolithic system--the time constant and membrane sensitivity to accelerations--and its anatomical characteristics. An equation has been derived to calculate the effect of accelerations on the local foci of the sensory epithelium of the otolithic macula. The sensitivity of the otolithic apparatus is different for different animal species, different sensory surfaces and different acceleration vectors. Author

N74-33554 Joint Publications Research Service, Arlington, Va.
SOME PSYCHOPHYSIOLOGICAL CAUSES OF FLIGHT ACCIDENTS AND MEASURES FOR ENSURING FLIGHT SAFETY IN CIVIL AVIATION
A. V. Chapek *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 55-61 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 39-43 (For availability see N74-33546 23-04)

The reasons for flight accidents associated with personality factors of crew members and ground control personnel are discussed. The psychophysiological mechanisms of certain erroneous actions of the pilot and controller in an emergency situation are elaborated and some safety measures are suggested. Author

N74-33555 Joint Publications Research Service, Arlington, Va.
MAN'S PHYSICAL PERFORMANCE AFTER THIRTY-DAY HYPOKINESIA WITH COUNTERMEASURES c05
B. S. Katkovskiy, G. V. Machinskiy, P. S. Toman, V. I. Danilova, and B. F. Demida *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 62-68 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 43-47 (For availability see N74-33546 23-04)

A 30-day bedrest experiment in which healthy test subjects were kept in horizontal and antiorthostatic positions revealed a decline in max VO sub 2 and the total amount of the work done. The performance of the test subjects who were exposed to the antiorthostatic position was lower than that of horizontal subjects. The causes underlying the decline in physical performance and the effect of different preventive measures are discussed. The information level of such physical performance parameters as the amount of work done and max VO sub 2 is discussed. Author

N74-33556 Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF HUMAN GAIT AFTER 30-DAY HYPOKINESIA c05
I. F. Chekirda, A. V. Yeremin, V. I. Stepantsov, and I. P. Borisenkoj *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 69-74 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 48-51 (For availability see N74-33546 23-04)

The kinematics and coordination structure of the walking pattern of nine test subjects were analyzed after a 30-day bedrest experiment. A cyclogrammetric procedure helped to reveal characteristic changes in the walking structure induces by bedrest. These changes included a complication of the walking structure, appearance of additional correction signals from the central nervous system, a decrease in the amplitude of waves of spontaneous innervation origin, and an increase in the amplitude of waves of reactive and reactive innervation origin. The test subjects who had trained their walking and running habits in the recumbent position exhibited less marked changes in walking structure in comparison with the controls and with subjects who underwent electric stimulation of the muscles. Author

N74-33557 Joint Publications Research Service, Arlington, Va.
EVALUATION OF THE PROPHYLACTIC EFFECT OF LOWER BODY NEGATIVE PRESSURE (LBNP) DURING A THIRTY-DAY BEDREST REGIME
I. D. Pestov, V. S. Panchenko, and B. F. Asyamolov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 75-80 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 52-55 (For availability see N74-33546 23-04)

During a 30-day bedrest experiment the effect of lower body negative pressure (LBNP) applied as a countermeasure and the possibility of detecting orthostatic changes with the aid of a Valsalva maneuver and LBNP test were studied. LBNP used during the last five bedrest days was more effective than LBNP applied daily. The effect of LBNP training was also related to individual characteristics of the test subjects. Cardiovascular responses to the Valsalva maneuver and LBNP test were similar to the responses to the orthostatic test in their pattern and

direction. These tests used during the simulation of weightlessness reveal potential orthostatic intolerance of test subjects. Author

N74-33558 Joint Publications Research Service, Arlington, Va.
EXTERNAL METABOLISM OF MINERAL ELEMENTS IN MAN IN A BIOLOGICAL LIFE SUPPORT SYSTEM
M. I. Veber, I. I. Gitelzon, and Yu. N. Okladnikov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 81-87 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 55-60 (For availability see N74-33546 23-04)
Avail: NTIS

External metabolism of mineral elements (phosphorus, magnesium, sulphur, potassium, sodium, calcium) in man in a biological life support system has been studied. Whereas the external balance of these elements is satisfactory over a long period of time, their intake and excretion over a short period of time varies greatly. The amplitude of fluctuations in the daily excretion of the elements exceeds the variability of their intake with the food. Author

N74-33559 Joint Publications Research Service, Arlington, Va.
PSYCHONEUROLOGICAL DISTURBANCES IN EXPERIMENTAL SLEEP DEPRIVATION WITH INFORMATION RESTRICTION
O. N. Kuznetsov, L. P. Rozova, V. P. Stupnitskiy, Ye. V. Trufanova, and I. S. Zamaletdinov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 88-96 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 60-66 (For availability see N74-33546 23-04)

Behavioral reactions of healthy test subjects in experiments with 64- and 74-hour sleep deprivation were investigated. Test subjects were kept in separate isolation chambers for 10 days. During forced wakefulness they exhibited dysthymic disorders, typical isolation phenomena and states of asomnic disorientation and aspontaneity. The state of asomnic disorientation can be differentiated from the depersonalization and psychic automatism syndromes. In addition to increasing fatigue, biorhythmological mechanisms of alternation of sleep and wakefulness were also involved in the genesis of psychic disorders. The data obtained using personality procedures were analyzed from the point of view of modern pathophysiological concepts. Recommendations are made concerning medical monitoring during spaceflight. Author

N74-33560 Joint Publications Research Service, Arlington, Va.
SOME DATA ON THE LOCALIZATION OF GAS BUBBLES CAUSING HIGH-ALTITUDE DECOMPRESSION PAINS
V. P. Katuntsev and I. P. Poleshchuk *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 97-102 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 66-70 (For availability see N74-33546 23-04)

Decompression disease was analyzed in 61 test subjects during 357 altitude chamber ascents to altitudes of 6,000 to 9,500 m. Every 20 minutes the test subjects performed a standardized set of physical exercises. Self-observations of the subjects contributed to a better understanding of the bends during altitude decompression disease. The effect of occlusion cuffs on the pain level was studied. Physiological investigations suggest that decompression disease is brought about by extravascular gas bubbles located in not readily distensible tissues containing a large number of nerve receptors. Author

N74-33561 Joint Publications Research Service, Arlington, Va.
APPARATUS FOR DYNAMIC GAS MIXING FOR CARRYING OUT EXPERIMENTS AT REDUCED BAROMETRIC PRESSURE c05
A. N. Molodtsov, A. V. Sedov, and P. Ye. Ronskiy-Slavkin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 103-108 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 70-72 (For availability see N74-33546 23-04)

An apparatus developed for dynamic gas mixing was used in biomedical experiments in establishing the maximum admissible concentrations of carbon monoxide and methane for a man wearing individual protective gear and performing heavy physical labor in an atmosphere with reduced barometric pressure. Author

N74-33562 Joint Publications Research Service, Arlington, Va.
CAGE WITH A VARIABLE INTERNAL VOLUME FOR HYPOKINESIA c05
I. G. Krasnykh, D. N. Gavrilyuk, and V. Ye. Potkin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 107-109 Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 73-74 (For availability see N74-33546 23-04)

The effects of prolonged hypokinesia on dogs were studied by positioning the animals in a cage with adjustable movable walls. Thus a cage size was obtained that excluded loads on the animal's support motor apparatus and ensured considerable hypokinesia. G.G.

N74-33563 Joint Publications Research Service, Arlington, Va.
TWO-COORDINATE DEVICE FOR THE READ-OUT OF GRAPHIC INFORMATION c05
A. M. Zhdanov and V. S. Shirokov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 110-112 Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 74-76 (For availability see N74-33546 23-04)

A two-coordinated readout device is reported for the semiautomatic measurement of information parameters of graphic images and their input into electronic computers. The apparatus combines the merits of visual discrimination of informational graphic data from initial graphs and automatic coding of information and its input into an electronic computer. Author

N74-33564 Joint Publications Research Service, Arlington, Va.
ENGINEERING METHOD FOR COMPUTING ILLUMINATION OF THE WORK PLACE OF AN OPERATOR c05
S. M. Zalkind *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 113-116 ref Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul-Aug. 1974 p 76-78 (For availability see N74-33546 23-04)

A nomogram is formulated for determining the required illumination of a working plane for a stipulated level of visibility for different symbols. Using this nomogram it is possible to solve the following problems. (1) determine visibility of a scale symbol with the parameters alpha and k in the range of illuminations 30-140 lux; and (2) determine the necessary illumination for ensuring the normalized value of visibility of a scale symbol with the parameters alpha and k. Author

N74-33565 Joint Publications Research Service, Arlington, Va.
UNIVERSAL NATURE OF THE CHEMICAL BASIS OF LIVING SYSTEMS
L. M. Mukhin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 117-120 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 78-80 (For availability see N74-33546 23-04)

A comparison of absolute organogens in the earth's crust, in the universe, and in living matter shows that the chemical composition of living matter is far closer to that of the universe than to the earth' crust. A comparative analysis of the position of carbon and silicon in the scale of poling electro-negatives indicates the improbability of silicon as a basis for the structuring of life. Author

N74-33566 Joint Publications Research Service, Arlington, Va.
EFFECT OF HYPOKINESIA ON SOME INTEGRAL INDICES OF THE BODY CONDITION OF WHITE RATS
N. T. Svistunov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 121-124 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 80-81 (For availability see N74-33546 23-04)

In experimental animals prolonged hypokinesia causes a considerable lag in growth and development, a disturbance of metabolic processes, and a decrease in overall resistance and adaptation-compensatory possibilities of the body. Prolonged

maintenance of white rats under hypokinetic conditions with retention of the possibility of assuming natural poses and taking care of individual parts of the body causes less significant changes in the bodies of these animals than rigorous hypokinesia conditions. The rapid return of the principal integral indices to the initial levels and the progressive development of the animals after the experiment indicate absence of deep shifts and the maintenance at a high level of the adaptation-compensatory possibilities of the bodies of these experimental animals. Author

N74-33567 Joint Publications Research Service, Arlington, Va.
HUMAN NITROGEN BALANCE ASSOCIATED WITH REDUCED AND INCREASED ENERGY EXPENDITURES
V. V. Polyakov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 125-127 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 82-83 (For availability see N74-33546 23-04)

The dynamics of the nitrogen balance are studied for different levels of energy expenditures under conditions of regulated intake of food nitrogen into the human body. A nitrogen level in the ration of 7.98 g/day ensured a stable positive nitrogen balance. A nitrogen content in the diet of 6.79 g/day led by the 20th day to the establishment of a positive nitrogen balance; this indicates an adequate protein supply under hypodynamia conditions. Author

N74-33568 Joint Publications Research Service, Arlington, Va.
EFFECT OF 30-DAY HYPOKINESIA ON BODY REACTIVITY TO DRUGS
V. Ye. Belay and N. N. Uglova *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 128-130 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 83-84 (For availability see N74-33546 23-04)

Body reaction to a combination of central nervous system stimulants in the course of 30-day hypokinesia was studied. Reaction to drugs was evaluated from change in the ECG, arterial pressure, respiration rate, lung ventilation, oxygen consumption, elimination of carbon dioxide under ordinary conditions and against a background of a carefully measured physical load. Detected quantitative reactivity changes in the reaction to drugs depended on the period of hypokinesia and inidividual peculiarities of adaptation of the principal physiological systems of the body. Author

N74-33569 Joint Publications Research Service, Arlington, Va.
FUNCTIONAL STATE OF THE RECEPTOR APPARATUS OF ORGANS OF THE ORAL CAVITY DURING HYPOKINESIA
A. I. Volozhin, V. Yu. Kurlyandskiy, S. M. Budylina, I. D. Pestov, V. A. Khvatova, V. F. Gurina, and I. V. Rosinskaya *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 131-133 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 85-86 (For availability see N74-33546 23-04)

As a result of 30-day hypokinesia there were considerable changes in activity of the human oral cavity receptor apparatus, manifested in an increase in sensitivity of receptors of the supporting tissues of the tooth to a load, a decrease in sensitivity and inadequate perception of taste stimuli, a decrease in the level of mobilization of the taste receptors of the tongue, and an impairment of the gastro-lingual reflex. The tactile sensitivity gradient of the mucous membrane changes and the normal asymmetry of sensitivity to the right and left was smoothed out. Electric stimulation of the muscles during hypokinesia leads to normalization of activity of the oral cavity receptor apparatus. Author

N74-33570 Joint Publications Research Service, Arlington, Va.
MANS MENTAL PERFORMANCE UNDER CONDITIONS OF PROLONGED HYPOKINESIA WITH USE OF LOWER BODY NEGATIVE PRESSURE
K. K. Ioseliani *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 134-136 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 86-87 (For availability see N74-33546 23-04)

The joint effects of hypokinesia and lower body negative pressure on human mental performance were studied under time deficit conditions, complex differentiating activities, and memorization tasks. Results showed an inhibition of mental activity, deterioration of routine memory and attention, and a decrease of mechanical memory. Training with LBNP made possible the retention of a high level of performance under conditions of prolonged hypokinesia. Author

N74-33571 Joint Publications Research Service, Arlington, Va.
REACTION OF DISPROPORTIONATION OF CARBON MONOXIDE AS A STAGE IN THE PHYSICOCHEMICAL PROCESSES OF REGENERATION OF OXYGEN FROM CARBON DIOXIDE
T. N. Pavlova, V. A. Naumov, and A. P. Savin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 137-139 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 87-88 (For availability see N74-33546 23-04)

The catalytic reaction of disproportionation of carbon monoxide is used to determine oxygen regeneration system variants in a physicochemical process where the first stage is the direct decomposition of CO2 into CO and O2. Solid electrolytes plus the Bell reaction are utilized. The most promising catalyst for the Bell reaction is shown to be iron; the efficiency of the process increases considerably when hydrogen is introduced into the reaction mixture. G.G.

N74-33572*# Scientific Translation Service, Santa Barbara, Calif.
MICROBIOLOGICAL FACTORS IN THE MIGRATION OF CERTAIN MINERALS IN SOIL
T. V. Aristovskaya, A. Yu. Daragan, L. V. Zykina, and R. S. Kutozova Washington NASA Oct. 1974 19 p refs Transl. into ENGLISH from Pochvovedenie (Moscow), no. 9, 1969 p 95-104
(Contract NASw-2483)
(NASA-TT-F-15928) Avail: NTIS HC $4.00 CSCL 06M

The basic microbiological processes causing mobilization of chemical elements from poorly soluble compounds are discussed. It is concluded that the most important roles are played by: (1) the formation by microorganisms of mineral and organic acids and products forming complex compounds with mineral elements; (2) the release of biogenetic alkalis; (3) the effect of slimes formed by certain bacteria and algae; and (4) the life processes of microorganism reducing agents. Author

N74-33573*# Kanner (Leo) Associates, Redwood City, Calif.
EFFECT OF CAFFEINE ON BILE AND PANCREATIC JUICE SECRETION
Ch. Vaille, Ch. Debray, J. DeLaTour, Cl. Roze, and M. Souchard Washington NASA Oct. 1974 16 p refs Transl. into ENGLISH from Ann. Pharm. Fr. (France), v. 24, nos. 7-8, 1966 p 515-522
(Contract NASw-2481)
(NASA-TT-F-15978) Avail: NTIS HC $4.00 CSCL 06P

A series of experiments on rats demonstrate that caffeine alone has very little effect on bile secretion, but that it does produce a 100% increase in pancreatic flow, although the protein content of the pancreatic juice does not increase proportionately. Several possible explanations for this effect are offered, but it is not yet possible to draw any definite conclusions. Author

N74-33574*# Kanner (Leo) Associates, Redwood City, Calif.
MODELING OF A COMPLEX OF SYSTEMS OF THE ORGANISM WHICH ARE ASSOCIATED WITH BLOOD CIRCULATION AND CARRYING OUT OF PHYSIOLOGICAL EXPERIMENTS WITH THIS COMPLEX
L. A. Dartau Washington NASA Oct. 1974 15 p refs Transl. into ENGLISH from the book "Optimizatsiya Issledovaniye Operatsii. Bionika" Moscow, Nauka Press, 1973 p 229-235
(Contract NASw-2481)
(NASA-TT-F-15972) Avail: NTIS HC $4.00 CSCL 06P

A computer model of a complex of systems associated with blood circulation is discussed and illustrated with a diagram. Modeling and physiological tests are discussed, data are presented and comparisons of modeling and physiological tests are presented, for forced hypo- and hyperventilation, administration of arfonad and isolated perfusion of the carotid sinus. A model

experiment in regulation of an artificial heart is described and discussed, with a comparison of four control algorithms. Author

N74-33575*# Minnesota Univ., Minneapolis. Div. of Environmental Health.
PROJECT ENVIRONMENTAL MICROBIOLOGY AS RELATED TO PLANETARY QUARANTINE Progress Report, 1 Dec. 1973 - 29 May 1974
Irving J. Pflug 29 May 1974 15 p refs
(Grant NGL-24-005-160)
(NASA-CR-140447; SAPR-12) Avail: NTIS HC $4.00 CSCL 06M

Microbiological analyses of soil particles allow for the following conclusions: (1) there is a considerable range in the values of aerobic, mesophilic microbial counts associated with different size soil fractions; (2) as soil particle size increases, there is an increase in the mean microbial concentration per particle; (3) plate counts of aerobic, mesophilic organisms in unheated soils yielded a mean concentration of about six organisms per particle for the smallest soil fraction; (4) aerobic, mesophilic counts for sonicated particles heated at 80 C for 20 minutes yielded mean values of about two organisms per particle for the smallest particles; (5) some actinomycetes associated with the soil fractions could survive dry heat treatment at 110 C for one hour; and (6) soil particles stored under ambient laboratory conditions for 2.5 years aerobic, mesophilic plate counts which were comparable or slightly greater than the counts for more recently collected soil. Author

N74-33576# Texas Univ., Houston. M. D. Anderson Hospital and Tumor Inst.
RADIATION AND BIOPHYSICAL STUDIES ON CELLS AND VIRUSES Progress Report, 16 Oct. 1972 - 28 Feb. 1974
A. Cole 1974 51 p refs
(Contract AT(40-1)-2832)
(ORO-2832-126) Avail: NTIS HC $5.75

Progress is reported in studies on the effects of ionizing radiation on mammalian cells and on viruses. Topics discussed in detail include: the organization of the genetic structure of chromosomes and nucleoproteins; the effects of gamma and electron irradiation on cellular constituents with emphasis on DNA strand breaks and repair mechanisms; and the semiconductor properties of biomolecules and applications to melanin-containing cells. A list is included of 27 publications during the time period covered by this report that describe the findings in detail. NSA

N74-33577# Wyoming Univ., Laramie.
PHOTO-INITIATED PROCESSES IN VISION Technical Progress Report, 1 Jul. 1973 - 30 Jun. 1974
A. V. Guzzo 1974 6 p
(Contract AT(11-1)-1627)
(COO-1627-28) Avail: NTIS HC $4.00

Results are reported from studies on the initial photochemical processes associated with visual excitation in animals. NSA

N74-33578# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
THE DESIGN OF A MOCK CIRCULATION SYSTEM M.S. Thesis
W. H. Leliveld Jun. 1974 23 p refs
(TH-74-E-47; ISBN-90-6144-047-5) Avail: NTIS HC $4.25

A mock circulation system, consisting of an artificial left ventricle, an aorta and a termination, is presented. This model, which can serve several purposes, such as testing artificial heart valves, was specially built for the purpose of testing parameter estimation techniques on the human aorta under realistic conditions. The circulation system also offers the possibility to evaluate the measuring methods, as well as the possibility to verify the results obtained by estimating parameters of the aorta such as the elasticity of the aortic wall. Author (ESRO)

N74-33579# Naval Weapons Lab., Dahlgren, Va.
BIOMEDICAL ASPECTS OF NONIONIZING RADIATION
William C. Milroy Mar. 1974 97 p refs Presented at Proc. of Symp. on Biomed. Aspects of Nonionizing Radiation, Dahlgren, Va., 10 Jul. 1973
(AD-780222; NWL-TR-3110) Avail: NTIS CSCL 06/18

The report consists of the proceedings of a one-day Symposium on Biomedical Aspects of Nonionizing Radiation held on 10 July 1973 at the Naval Weapons Laboratory, Dahlgren, Virginia in conjunction with the opening and dedication of the new Biomedical Research Laboratory. It includes a compilation of six invited papers presented at the Symposium by leading authorities in the fields of bio-engineering, comparative biology, human exposure factors, high power pulses, and EMP bio-effects. Author (GRA)

N74-33580# Rockefeller Univ., New York. Center for Visual Science.
SPATIAL SENSITIZATION BY SINUSOIDALLY MODULATED BACKGROUNDS Ph.D. Thesis
Michael A. Nelson May 1974 63 p refs
(Contract N00014-67-A-0398-0007)
(AD-781334; TR-74-1) Avail: NTIS CSCL 05/10

The response of the visual system to increment flashes presented on sinusoidally flickering backgrounds is not linear in relation to the stimulus conditions employed in these experiments. The mechanisms which determine increment thresholds on flickering backgrounds have many characteristics which are similar to the receptive field organization of retinal ganglion cells. A model of sensitization based on the disturbing influence on increment thresholds of nearby contours does not appear to be consistent with these data, whereas center-surround models appear to account for the data well. GRA

N74-33581# Maryland Univ., College Park. Dept. of Psychology.
SOME RELATIONSHIPS AMONG AND BETWEEN MEASURES OF EMPLOYEE PERCEPTIONS AND OTHER INDICES OF ORGANIZATION EFFECTIVENESS
Benjamin Sneider and Robert A. Snyder May 1974 45 p refs
(Contract N00014-67-A-0239-0025; NR Proj. 151-350)
(AD-781888; RR-5) Avail: NTIS CSCL 05/10

Relationships with respect to two measures of job satisfaction and one of organizational climate, among seven production and turnover indices of organizational effectiveness, and between the two sets of measures were investigated in 50 life insurance agencies. Climate and satisfaction measures are correlated. People appear to agree more on the climate of their agency than they do on their satisfaction. Agency effectiveness is related to gross agency size, satisfaction and retention. Implications of these data for research on climate and satisfaction as well as organizational change are discussed. (Modified author abstract) GRA

N74-33582# Hawaii Univ., Honolulu. PEACESAT Project.
PACIFIC SATELLITE HEALTH INFORMATION STUDY Final Report, May 1972 - Aug. 1973
John Bystrom May 1974 151 p refs
(Contract HS-72-4706)
(PB-232367/3; LHNCBC-74-05) Avail: NTIS HC $4.75 CSCL 06E

The Pacific satellite health information project was developed to assist development of effective medical and health information transfer. The following results are reported: (1) A study environment was developed in the Pacific, and committees were formed for health information and evaluation; (2) Studies were completed on medical communication requirements, health care status and status of libraries in the U.S. and related areas of the Pacific; (3) Demonstration satellite ground terminals were constructed; (4) Biomedical data transmission tests were undertaken using the voice grade satellite circuit; (5) and pilot demonstrations of satellite communications were made. GRA

N74-33583# National Inst. for Occupational Safety and Health, Rockville, Md.
OCCUPATIONAL NOISE AND HEARING 1968 - 1972 Final Report
Barry L. Lempert and T. L. Henderson 1973 54 p
(PB-232284/0; NIOSH-TR-201-74) Avail: NTIS HC $5.75 CSCL 06J

The aim of the occupational noise and hearing survey was to characterize noise exposure levels in a variety of industries, to describe the hearing status of workers exposed to such noise conditions, and to establish a relationship between occupational

noise exposure and hearing loss that would be applicable to general industry. The four primary types of data collected during the study were noise measurements, personal background information, medical and otologic data, and audiometric data.
GRA

N74-33584*# Naval Aerospace Medical Research Lab., Pensacola, Fla.
PERCEPTION OF BODY POSITION AND SUSCEPTIBILITY OF MOTION SICKNESS AS FUNCTIONS OF ANGLE OF TILT AND ANGULAR VELOCITY IN OFF-VERTICAL ROTATION
Earl F. Mill and Ashton Graybiel 4 Jun. 1973 13 p refs
(NASA Order T-81633; NASA Order T-59048)
(NASA-CR-140035; AD-772702/7; NAMRL-1182) Avail: NTIS HC $3.00 CSCL 06/19

Four normal subjects manifested little or no susceptibility to motion sickness in a chair device tilted 10 degrees off-vertical and rotated at 2.5 rpm; with further rate increases the end-point to mild symptoms was always reached and within increasingly short durations. Susceptibility was maximal at either 15 rpm or 20 rpm, but with higher rotational rates, declined rapidly, reaching a plateau of relatively low susceptibility at 40 rpm and 45 rpm; at these higher velocities, the subjects began to lose their sensation of being tilted off-vertical. Two subjects were asymptomatic when the chair was tilted 2.5 degrees off-vertical and rotated at 17.5 rpm; with greater angles of tilt susceptibility of all subjects increased in ever-decreasing amounts. Author (GRA)

N74-34417 National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
ELECTROMAGNETIC FIELDS AND WOUND REPAIR
C. Romero-Sierra (Queen's Univ., Kingston, Ontario), S. Halter (Queen's Univ., Kingston, Ontario), and J. A. Tanner *In its* Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 30 Jun. 1974 p 25-34 refs (For availability see N74-34414 23-34)

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N74-33585*# Pillsbury Mills, Inc., Minneapolis, Minn.
SPACE SHUTTLE/FOOD SYSTEM STUDY. VOLUME 2, APPENDIX E: ALTERNATE FLIGHT SYSTEMS ANALYSIS
[1974] 94 p
(Contract NAS9-13138)
(NASA-CR-134377) Avail: NTIS HC $7.75 CSCL 06H

The functional requirements of stowage, preparation, serving, consumption, and cleanup were applied to each of the five food mixes selected for study in terms of the overall design of the space shuttle food system. The analysis led to a definition of performance requirements for each food mix, along with a definition of equipment to meet those requirements. Weight and volume data for all five systems, in terms of food and packaging, support equipment, and galley installation penalties, are presented. Author

N74-33586# Civil Aeromedical Inst., Oklahoma City, Okla.
SONIC BOOM STARTLE EFFECTS: REPORT OF A FIELD STUDY
Richard I. Thackray, Ragnar Rylander (Natl. Swedish Environ. Protection Board), and R. Mark Touchstone Jul. 1973 19 p refs
(AD-773451; FAA-AM-73-11) Avail: NTIS HC $3.00

Results of a sonic boom field study conducted in Sweden during October 1972 are reported. Ten female subjects were tested indoors on each of six days. Fighter aircraft flying at various heights over the test site produced booms with outdoor overpressures ranging from 60-640 N/sq m. The number of booms extended from 5 to 13 per day. Subjects performed indoors on an arm-hand steadiness task. The results indicated that outdoor overpressures ranging from 70-120 N/sq m. (26-35 N/sq m. indoors) produced reflexive arm-hand movements in about 10 per cent of the subjects. Booms of 300 N/sq m. (67 N/sq m. indoors) and greater produced responses in about 75 per cent of the subjects. Between these extremes of overpressure there was the suggestion of a critical overpressure range lying between 150-180 N/sq m. (40-46 N/sq m. indoors) in which an abrupt increase in startle response occurred. Author

N74-33587# Civil Aeromedical Inst., Oklahoma City, Okla.
THE RELATIONSHIP OF AGE AND ATC EXPERIENCE TO JOB PERFORMANCE RATINGS OF TERMINAL AREA TRAFFIC CONTROLLERS
Bart B. Cobb, Peter L. Nelson, and John J. Mathews Apr. 1973 52 p refs
(AD-773449; FAA-AM-73-7) Avail: NTIS HC $3.75

Experimental ratings of job performance and other data are reported for several hundred journeymen radar control specialists of 17 high IFR traffic density terminal area traffic control facilities. Significant inverse relationships were found between job ratings and both chronological age and tenure in FAA ATC work. Results of a comparative analysis of data for dichotomized groups aged 40 and younger and 41 and older within each of several length-of-experience groupings indicated that: (1) the younger subjects of every experience level tended to receive higher evaluations than those over 40 years old; and (2) the greater mean differences in performances ratings pertained to the dichotomized age groups having over 10 years experience. Other results also suggested that ATCS proficiency is more apt to decline as a result of factors associated with aging than as a consequence of presumed effects stemming from lengthy ATC experience. Author

N74-33588*# AiResearch Mfg. Co., Los Angeles, Calif.
MEMBRANE EVAPORATOR/SUBLIMATOR INVESTIGATION
J. Elam, J. Ruder, and H. Strumpf 2 Apr. 1974 44 p refs
(Contract NAS9-10465)
(NASA-CR-140261; AiResearch-74-10256) Avail: NTIS HC $5.25 CSCL 06K

Data are presented on a new evaporator/sublimator concept using a hollow fiber membrane unit with a high permeability to liquid water. The aim of the program was to obtain a more reliable, lightweight and simpler Extra Vehicular Life Support System (EVLSS) cooling concept than is currently being used.
Author

N74-33589*# AiResearch Mfg. Co., Los Angeles, Calif.
MEMBRANE WATER DEAERATOR INVESTIGATION
J. Elam, J. Ruder, and H. Strumpf 26 Feb. 1974 34 p refs
(Contract NAS9-10465)
(NASA-CR-140259; AiResearch-74-10072) Avail: NTIS HC $4.75 CSCL 06K

The purpose of the membrane water deaerator program was to develop data on a breadboard hollow fiber membrane unit that removes both dissolved and evolved gas from a water transfer system in order to: (1) assure a hard fill of the EVLSS expendable water tank; (2) prevent flow blockage by gas bubbles in circulating systems; and (3) prevent pump cavitation. Author

N74-33590*# AiResearch Mfg. Co., Los Angeles, Calif.
MEMBRANE HUMIDITY CONTROL INVESTIGATION
J. Elam, J. Ruder, and H. Strumpf 15 Apr. 1974 30 p refs
(Contract NAS9-10465)
(NASA-CR-140260; AiResearch-74-10255) Avail: NTIS HC $4.50 CSCL 06K

The basic performance data on a hollow fiber membrane unit that removes water from a breathing gas loop by diffusion is presented. Using available permeability data for cellulose acetate, a preliminary design was made of a dehumidifier unit that would meet the problem statement. M.C.F.

N74-33591*# Columbia Univ., New York. School of Public Health.
EVALUATION OF THE EFFECTS OF ONE YEAR'S OPERATION OF THE DYNAMIC PREFERENTIAL RUNWAY SYSTEM
Paul N. Borsky Oct. 1974 23 p refs
(Grant NGL-33-008-118)

(NASA-CR-140488) Avail: NTIS HC $4.25 CSCL 05E

The FAA introduced an experimental aircraft operations program at JFK Airport called the Dynamic Preferential Runway System (DPRS) in the summer of 1971. The program is designed to distribute air traffic as equally as possible over the surrounding communities, to limit periods of continuous overflight and to vary the same hours of overflight from day to day. After a full year's operation, an evaluation was made of the system's effectiveness. All of the operation's goals were moderately achieved with the greatest relief in reduced overflight afforded the most heavily impacted areas. Few residents, however, were aware of DPRS or felt that it had greatly reduced annoyance or represented a major effort by the aircraft authorities. Statistical analyses of reported annoyance obtained from two independent surveys in 1969 and 1972 reveal limited reductions in annoyance in 1972, with shifts from reported high annoyance to moderate annoyance. Author

N74-33592*# Techtran Corp., Glen Burnie, Md.
THE PNEUMOOXYHEMOGRAPH-3, AN INSTRUMENT FOR THE INVESTIGATION OF THE FUNCTIONAL STATE OF BLOOD CIRCULATION AND RESPIRATION
A. M. Sviridov Washington NASA Oct. 1974 9 p Transl. into ENGLISH from Med. Tekhn. (Moscow), no. 4, Jul. - Aug. 1973 p 50-53
(Contract NASw-2485)
(NASA-TT-F-15867) Avail: NTIS HC $4.00 CSCL 06B

An instrument is reported that can simultaneously or continuously record on paper tape a pneumogram, oxyhemogram and electrocardiogram with an indication of time. Simple changes in speed make it possible to record the frequency and rhythm of heart contractions. Such information is vital in treating cardiopulmonary conditions. Author

N74-33593*# Kanner (Leo) Associates, Redwood City, Calif.
DETECTION OF ACOUSTIC SIGNALS OF DIFFERENT DURATION UNDER THE ACTION OF CERTAIN DRUGS
A. V. Baru Washington NASA Oct. 1974 21 p refs Transl. into ENGLISH from Zh. Vyssh. Nerv. Deyateln. im. I. P. Pavlova (USSR), v. 17, no. 1, 1967 p 107-115
(Contract NASw-2481)
(NASA-TT-F-15977) Avail: NTIS HC $4.25 CSCL 05E

An experimental verification was made of the hypothesis that there are two spatially distinct mechanisms of the analysis of short and long acoustic signals and that the former is associated with the activity of the temporal levels of the cortex of the cerebral hemispheres. Two drugs with different mechanisms of action were administered to eight healthy adults and, over different periods of time, to intact and operative dogs. Measurements were made of the detection thresholds for ringing of a 1000 Hz tone and white noise with duration of 2, 4, 12, 16, 36, 80, 100, 210, 300, 400, 500, and 1000 msec. It was found that caffeine causes decreases in the detection threshold for short signals, while amphetamine causes these changes for longer signals (t somewhat greater than 10 msec). Author

N74-33594# Commissariat a l'Energie Atomique, Grenoble (France).
ELECTRODES IN ELECTROPHYSIOLOGY
J. Max 23 May 1973 28 p refs In FRENCH Presented at the Course given at the Faculty of Med. Meeting, Clermont-Ferrand, France, 27 Apr. 1973
(CEA-Conf-2511; Conf-730478-1) Avail: AEC Depository Libraries HC $4.50

After reporting on the utilization of electrodes in electrophysiology as well as on the imperatives to which these electrodes respond, a brief report was made on the theory of electrodes. A review was also made of the different characteristics of these electrodes. The principle types of electrodes along with principle setups for them are reported. Transl. by E.H.W.

N74-33595# Air Force Human Resources Lab., Brooks AFB, Tex.
RELATIONSHIPS AMONG AN INDIVIDUAL INTELLIGENCE TEST AND TWO AIR FORCE SCREENING AND SELECTION TESTS Final Report, Feb. 1972 - Jul. 1973
David F. McGrevy, Stephen B. Knouse, and Ronnie A. Thompson Mar. 1974 17 p refs
(AF Proj. 7719)
(AD-781033; AFHRL-TR-74-25) Avail: NTIS CSCL 05/10

With the implementation of the all volunteer force concept, the Air Force must insure that the objectively measurable range of ability in its manpower pool is being utilized. This is especially true for minority groups who have been categorized and channeled into military career areas based upon their performance on two selection tests: the Armed Forces Qualification Test (AFQT) and the Airman Qualifying Examination (AQE). To investigate the relationship of the AFQT and AQE to the general mental ability of different racial groups of airmen, a sample of 100 black and 100 white Air Force basic trainees was administered an established test of general mental ability, the Wechsler Adult Intelligence Scale (WAIS). The verbal, performance, and full scale IQ scores of the white and black airmen were compared to their AFQT scores and their four AQE aptitude indexes. Significant differences between black and white airmen were found on the AFQT, the four AQE aptitude indexes, and the three WAIS IQs. Regression analyses demonstrated most differences to be interaction effects between race and Air Force test scores. Implications for further research into Air Force airmen selection tests were discussed. Author (GRA)

N74-33596# Civil Aeromedical Inst., Oklahoma City, Okla.
CHARACTERISTICS OF MEDICALLY DISQUALIFIED AIRMAN APPLICANTS DURING CALENDAR YEAR 1971
Charles F. Booze, Jr. May 1974 18 p refs
(AD-781684; FAA-AM-74-5) Avail: NTIS CSCL 05/9

The study quantifies some medical and general descriptive characteristics of airmen medically disqualified during calendar year 1971. Such information has been of continual interest to the Office of Aviation Medicine and the aviation community for purposes ranging from program monitoring to disability risk determination. Specifically, the study presents descriptive data concerning age, sex, occupation, class of medical certificate applied for, cause-specific denial rates, and total flying time for medically disqualified applicants. Separate attention is devoted to airline pilots as a result of numerous inquiries. GRA

N74-33597# Applied Science Associates, Inc., Valencia, Pa.
IMPROVING JOB PERFORMANCE AIDS THROUGH CONDENSATION, DUAL-LEVEL PRESENTATION, PROMOTION OF LEARNING, AND ENTRY BY MALFUNCTION SYMPTOMS Final Report, 15 Aug. - 15 Dec. 1973
Reid P. Joyce Mar. 1974 82 p refs
(Contract F33615-73-C-4033; AF Proj. 1710)
(AD-781757; AFHRL-TR-74-12) Avail: NTIS CSCL 05/9

The report describes the research effort that attempted to simplify and condense the presentation of Job Performance Aid (JPA) data. It also describes a method of presenting technical data to both experienced and inexperienced personnel in one JPA format. Such factors as text limitations, illustration criteria, layout restrictions, and physical size of the manuals were found to contribute to the excessive bulk of the JPAs. Controls were developed for each of the influencing factors. Dual-level presentation of technical data was also studied. This portion of the study identified the types of information required, and not required, by experienced technicians. (Modified author abstract) GRA

N74-33598# Naval Air Development Center, Warminster, Pa. Crew Systems Dept.
THE APPLICATION OF THERMAL SEALING TO AIRCREWMAN'S INFLATABLE PROTECTIVE EQUIPMENT
Robert Z. Snyder 14 Mar. 1974 16 p refs
(F5123401)
(AD-782355; NADC-74034-40) Avail: NTIS CSCL 06/17

A program was undertaken to develop material research and thermal sealing methods to improve the overall characteristics of aircrew inflatable protective equipment, making use of impermeable coated fabrics. Anti-exposure suits, anti-exposure mittens and hood, anti-G coveralls, life preservers and life rafts, are now assembled using neoprene-coated nylon and a cold cementing procedure; this method of construction, however, requires many hours of labor and results in excessive stiffness and bulk in the finished item. Polyurethane-coated nylon fabric of various weights, construction, and coatings were investigated, as well as dielectric and ultrasonic thermal sealing techniques,

equipment, and final assembly criteria with the ultimate goals being: weight reduction without sacrifice of seam strength, increased comfort in personally worn items, production cost reduction, and improved reliability. (Modified author abstract) GRA

N74-33599# Essex Corp., Alexandria, Va.
EVALUATION OF THE ANTHROPOMETRIC COMPLIANCE TOOL Final Report, Jun. - Dec. 1973
May 1974 101 p
(Contract DOT-HS-120-3-773)
(PB-232540/5; DOT-HS-801-124) Avail: NTIS HC$4.50 CSCL 14B

The objectives of the investigation were to: (1) establish the utility of the anthropometric compliance tool as a field test instrument; (2) determine the reliability of tool measurements; and (3) formulate recommendations for tool redesign or tool procedure modification. The tool evaluation was conducted by means of an empirical investigation of its accuracy, reliability, and usability in five types of vehicles. Subjects were selected for this investigation to be representative of the general population of compliance test personnel. The tool was evaluated in terms of its capability to measure to two foot controls and three hand controls. Measures of performance included time to assemble, install, and use the tool, procedural errors, and tool accuracy and reliability in measuring distances to controls with respect to the seating reference point. GRA

N74-33600# Southwest Research Inst., San Antonio, Tex.
DEVELOPMENT OF ANALYTIC TECHNIQUES TO MEASURE HUMAN EXPOSURE TO FUEL ADDITIVES Final Report
Donald E. Johnson, John B. Tillery, John M. Hosenfeld, and James W. Register Mar. 1974 163 p refs
(Contract EPA-68-02-0595)
(PB-232124/8; SwRI-01-3451-001; EPA-650/1-74-003) Avail: NTIS HC $5.00 CSCL 06F

This study was to investigate analytical and sampling methodology for measuring amount of exposure and health effects of fuel additives to urban and rural populations. Both human exposure to normal levels of fuel additives present in urban traffic and to the high concentration under occupational conditions such as attendants in garages and parking lots and to policemen working in heavily trafficked areas. Fuel additives studied included the heavy metals, lead, manganese, copper, and zinc. Also measured in human tissue samples was the fuel impurity, cadmium. Trace metals in hair were determined to reflect long-term exposure. Blood and urine samples reflected short-term exposure. Feces measurement for lead and cadmium provided an estimation of dietary contributions. GRA

N74-33601# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EFFECTS OF THE PHYSIOLOGICAL ENVIRONMENT ON THE LONG-TERM PHYSICAL PERFORMANCE OF POLYMERIC MATERIALS Annual Report, Oct. 1972 - Nov. 1973
J. Moacanin, R. F. Fedors, J. D. Ingham, and E. F. Cuddihy 14 Mar. 1974 105 p refs Sponsored by NIH
(PB-232641/1; JPL-1200-160) Avail: NTIS HC $4.50 CSCL 06L

Extensive studies were made on the time-dependent physical properties of segmented polyetherurethanes, a class of elastomers being evaluated for implantable devices. It was shown that uniaxial tensile properties can be factorized, as previously demonstrated for conventional vulcanizates. Hence, a basis for the assessment of long-term fatigue, was established. Moreover, it was shown that sorbed water modifies properties markedly. The swelling behavior in water of both the urethane elastomer and of poly-HEMA grafted to the same elastomer was studied. Swelling of the poly-HEMA phase was nearly independent of crosslink density. A unique dip-molding process was developed for the fabrication of bladders from the urethane elastomer. GRA

N74-33602# National Inst. for Occupational Safety and Health, Rockville, Md.
AN OCCUPATIONAL HEALTH SURVEY OF SELECTED AIRPORTS Final Report
Lee B. Larsen 1974 78 p refs
(PB-232248/5; NIOSH-TR-204-74) Avail: NTIS HC $4.00 CSCL 06J

The objective of the survey was to describe the potential occupational health hazards present in airport operations. No attempt was made to evaluate safety hazards. This survey was conducted primarily to define potential industrial hygiene hazards, and to determine what medical and industrial hygiene services are provided those associated with the airline industry. Industrial hygiene surveys were conducted in the following work areas: office, warehouse and air freight, cafeteria and kitchen, ramps, airport maintenance, baggage handling, airline reservations and aircraft maintenance. Some recommended control guidelines and work practices were given. GRA

N74-33603# Army Foreign Science and Technology Center, Charlottesville, Va.
MINERAL COMPOSITION OF FOOD RATIONS FOR TESTERS OF THE BIOLOGICAL LIFE SUPPORT SYSTEM
M. I. Veber and Yu. N. Okladnikov 17 Mar. 1974 8 p refs Transl. into ENGLISH from Vop. Pitan. (USSR), no. 2, Mar. - Apr. 1973 p 24-26
(AD-781967; FSTC-HT-23-1853-73) Avail: NTIS CSCL 06/8

Mineral composition of a diurnal food ration made up predominantly of lyophilized products and of the same ration after replacement of its vegetable constituents by a nutritional biological mass of higher plants grown in a phytotrone of the biological human life support system was investigated. The final results prove that as concerns the phosphorus, magnesium, sulphur, potassium, sodium, and calcium levels the compositions of the ration under study do not differ essentially one from the other and meet the recommended physiological standards. GRA

N74-33540 Oslo Univ. (Norway). Inst. of Work Physiology.
A PHYSIOLOGICAL COMPARISON OF THE PROTECTIVE VALUE OF NYLON AND WOOL IN A COLD ENVIRONMENT
Kaare Rodahl, Fredric A. Giere, Peer H. Staff, and Bertil Wedin *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 53-57 refs (For availability see N74-33534 23-04)

N74-33544 Royal Naval Air Medical School, Hillhead (England).
AIRCREW SURVIVAL TRAINING IN THE UNITED KINGDOM AND NORTHERN NORWAY
W. J. Blake *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 91-93 (For availability see N74-33534 23-04)

N74-33555 Joint Publications Research Service, Arlington, Va.
MAN'S PHYSICAL PERFORMANCE AFTER THIRTY-DAY HYPOKINESIA WITH COUNTERMEASURES
B. S. Katkovskiy, G. V. Machinskiy, P. S. Toman, V. I. Danilova, and B. F. Demida *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 62-68 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 43-47 (For availability see N74-33546 23-04)

N74-33556 Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF HUMAN GAIT AFTER 30-DAY HYPOKINESIA
I. F. Chekirda, A. V. Yeremin, V. I. Stepantsov, and I. P. Borisenkoj *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 69-74 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 48-51 (For availability see N74-33546 23-04)

N74-33561 Joint Publications Research Service, Arlington, Va.
APPARATUS FOR DYNAMIC GAS MIXING FOR CARRYING OUT EXPERIMENTS AT REDUCED BAROMETRIC PRESSURE
A. N. Molodtsov, A. V. Sedov, and P. Ye. Ronskiy-Slavkin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 103-106 refs Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 70-72 (For availability see N74-33546 23-04)

N74-33562 Joint Publications Research Service, Arlington, Va.
CAGE WITH A VARIABLE INTERNAL VOLUME FOR

HYPOKINESIA
I. G. Krasnykh, D. N. Gavrilyuk, and V. Ye. Potkin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 107-109 Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 73-74 (For availability see N74-33546 23-04)

N74-33563 Joint Publications Research Service, Arlington, Va.
TWO-COORDINATE DEVICE FOR THE READ-OUT OF GRAPHIC INFORMATION
A. M. Zhdanov and V. S. Shirokov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 110-112 Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul.-Aug. 1974 p 74-76 (For availability see N74-33546 23-04)

N74-33564 Joint Publications Research Service, Arlington, Va.
ENGINEERING METHOD FOR COMPUTING ILLUMINATION OF THE WORK PLACE OF AN OPERATOR
S. M. Zalkind *In its* Space Biol. and Aerospace Med., Vol. 8, No. 4, 1974 (JPRS-63175) 10 Oct. 1974 p 113-116 ref Transl. into ENGLISH from Kosm. Biol. Aviakosmich. Med. (Moscow), v. 8, no. 4, Jul-Aug. 1974 p 76-78 (For availability see N74-33546 23-04)

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N74-33604*# Kanner (Leo) Associates, Redwood City, Calif.
DISTRIBUTION OF SUBSTANCES IN SYSTEMS WITH A FREE AND A BOUND SOLVENT
V. D. Chmil Washington NASA Sep. 1974 13 p refs Transl. into ENGLISH of "Raspredeleniye Veshchestv v Sistemakh so Svobodnym i Svyazannym Rastvoritelem" (USSR), Zh. Fiz. Khim., v. 40, no. 3, 1966 p 667-673
(Contract NASw-2481)
(NASA-TT-F-15941) Avail: NTIS $4.00 CSCL 07C

The distribution of caffeine between water and organic solvents (chloroform, dichloroethane) was studied over a wide range of concentrations and temperatures. The ratios of analytically determined compound concentrations, changes in entropy, enthalpy, isobaric and isothermal potential were calculated for the use of free and carrier adsorbed solvents. The activity of the caffeine was greater when bound solvents were used than when using free solvents. The difference in the changes in isobaric and isothermal potential for free and bound organic solvents serves as a measure of the extent to which the solvent is bound. Author

N74-33605*# National Aeronautics and Space Administration, Washington, D.C.
ANALYTICAL AND APPLIED CHEMISTRY: A COMPILATION Technology Utilization
[1974] 26 p
(NASA-SP-5974(01)) Avail: NTIS HC $1.00 CSCL 07D

Analytical chemistry and chemical processes and applied chemistry are presented. The reporting source is given for the dissemination of information. M.C.F.

N74-33606*# Scientific Translation Service, Santa Barbara, Calif.
LOW MOLECULAR ORGANIC ACIDS IN SOD-PODSOL FOREST SOILS
R. A. Gubanova Washington NASA Oct. 1974 12 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR (Minsk), v. 14, no. 3, 1970 p 264-267
(Contract NASw-2483)
(NASA-TT-F-15946) Avail: NTIS HC $4.00 CSCL 07C

Fumaric, malonic, citric, succinic, glucuronic, oxalic, and tarzaric acids were found in sod-podsolic soil up to the depth of 100 cm by means of thin-layer and paper chromatography. Their partition in the soil profile was the same under spruce or oak forest. The maximum quantity of these acids was found in top horizons (0-2; 2-4 cm). The amount of organic acids was higher under spruce forest than under oak. Author

N74-33607*# Scientific Translation Service, Santa Barbara, Calif.
AN INVESTIGATION OF CHANGES IN THE CHEMICAL COMPOSITION OF LOWLAND PEAT IN THE PROCESS OF SELF-HEATING. 7. THE FORMATION OF ORGANIC ACIDS
S. S. Mal and G. I. Maksimenok Washington NASA Oct. 1974 10 p refs Transl. into ENGLISH from Vestsi Akad. Navuk Belarusk. SSR, Ser. Khim. Navuk (Minsk), no. 3, 1971 p 87-90
(Contract NASw-2483)
(NASA-TT-F-15945) Avail: NTIS HC $4.00 CSCL 07C

Peats with 35-40 and 50% decomposition on storage under conditions favoring biological activity (less than 75 deg) formed small amounts of organic acids (from 0.07-0.11 initially to 0.32-5% in 8 months storage). On heating at less than 75 deg, the acid content rose rapidly to 0.9 - 1.3% in 4 months; the reaction products included glutaric and oxalic acids, their concentrations rising with the increasing storage period. At these temperatures, some hydroxy (glycolic, malic, and lactic) acids were also seen in small amts. The mono-, di-, and hydroxycarboxylic acids identified were typical of the products of oxidative degradation of hydrocarbons. The direct relation noted between the hydrocarbon content of peats and the amounts of organic acids formed on heating them confirmed formation of the acids by chemical conversion of the hydrocarbons. Author

N74-33608*# Scientific Translation Service, Santa Barbara, Calif.
SULFURIC ACID HYDROLYZATES OF LOWLAND PEATS AS GROWTH STIMULANTS OF MICROORGANISMS AND PLANTS. 3: AN INVESTIGATION OF THE COMPOSITION OF ORGANIC ACIDS
G. A. Yevdokimova and G. I. Raytsina Washington NASA Oct. 1974 10 p refs Transl. into ENGLISH from Vestsi Akad. Navuk Belarusk. SSR, Ser. Khim. Navuk (Minsk), no. 3, 1971 p 91-94
(Contract NASw-2483)
(NASA-TT-F-15943) Avail: NTIS HC $4.00 CSCL 07C

The grade of peat, H_2SO_4 concentration (in the range of 2-30%), or reaction pressure (1 or 12-16 atm.) did not affect the composition of organic acids in the hydrolyzates (2-3.1 and 2.3-5.6%, respectively, of volatile and nonvolatile acids). All of the hydrolyzates contained succinic acid (known for its high biological activity), whose concentration was maximum in the products obtained with 5% H_2SO_4 at high pressure. Paper chromatography revealed the presence of nonvolatile oxalic tartaric, citric, glycolic, maleic, malonic, malic, glutaric, fumaric, adipic, and azelaid acids. Of these, oxalic and succinic acids were significant. Author

N74-33609*# Kanner (Leo) Associates, Redwood City, Calif.
EFFECT OF BENTONITE ON THE ENZYMATIC ACTIVITY OF SOIL MICROFLORA
Z. Ambroz Washington NASA Oct. 1974 10 p refs Transl. into ENGLISH from Rostlinna Vyroba (Prague), v. 15, no. 2, 1969 p 209-214
(Contract NASw-2481)
(NASA-TT-F-15979) Avail: NTIS HC $4.00 CSCL 07C

The presence of bentonite (0.1-2%) in a sandy and liquid medium with proteins stimulates the forming of neutral and alkaline proteases in mixed bacterial cultures and catalase activity. In the case of a concentration above 5% in the nutrient medium, a depressive influence predominates. In the presence of bentonite, the accumulation curves of enzymes reach their maxima earlier than they do in the control medium. Proteases absorbed by 15% bentonite are inactivated by 75%. Author

N74-33610# Columbia Univ., New York. Liquid Metals Research Lab.
DETERMINATION OF INTERFACIAL TENSION AT HIGH TEMPERATURES. SURFACE TENSION OF POTASIUM AND INTERFACIAL TENSION OF Li/LiCl TO 850 C
J. W. Chung and C. F. Bonilla 1973 7 p refs Presented at 6th Symp. on Thermophys. Properties, Atlanta, 6-8 Aug. 1973 Sponsored by AEC
(COO-3027-7; Conf-730851-2) Avail: NTIS HC $3.00

A modified maximum bubble pressure apparatus suitable for high temperature determination of interfacial tension in a closed vessel was devised. It employs two capillaries of different diameters running downwards from the bottom of an upper pool to the same depth in a lower pool. A conical plug that can close off the larger tube permits utilization of either capillary at will. Simultaneous solution of Schroedinger's equation with the two maximum bubble pressure values yields the surface or interfacial tension conveniently without requiring observation of the submergence. The surface tension of potassium was measured under argon from 77 to 845 C, showing internal consistency and substantial agreement with some of the earlier studies. The interfacial tension of the system Li/LiCl was then measured by the same method from its melting point of 618 to 845 C. The results agree roughly with Antonoff's rule. Author (NSA)

N74-33611# Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.
MECHANISMS OF BIOLUMINESCENCE, CHEMILUMINESCENCE, AND OF THEIR REGULATION Progress Report, 3 year period ending Mar. 1974
H. H. Seliger 1974 29 p refs
(Contract AT(11-1)-3277)
(COO-3277-29) Avail: NTIS HC $4.50

Molecular mechanisms for the chemical production of excited states of molecules were investigated and compared with photoexcitation processes. Biological systems were also studied in terms of the mechanism of enzyme function in the catalysis of bioluminescence and the mechanisms of regulation and control of bioluminescence. Instrumentation for the absolute measurement of intensities and spectra of light was developed. Author

N74-33612# California Univ., Livermore. Lawrence Livermore Lab.
LINE BROADENING AND COLLISIONAL STUDIES OF CO2 USING THE TECHNIQUES OF SATURATION SPECTROSCOPY Ph.D. Thesis - Calif. Univ.
T. W. Meyer 9 Apr. 1974 225 p refs
(Contract W-7405-eng-48)
(UCRL-51561) Avail: NTIS HC $7.60

A high resolution spectrometer is constructed for the purpose of making line broadening and collisional studies of CO2 using saturation spectroscopic techniques. The primary purpose of these measurements is three fold: to obtain the pressure broadening coefficients for CO2 in collision with a variety of foreign gas perturbers, to characterize the nonlinear interaction of a CO2 laser electric field with the absorbing CO2 medium in the formation of the saturated resonance (Lamb dip), and to investigate the forces involved in intermolecular collisions using the data of 1. NSA

N74-33613# Sandia Labs., Albuquerque, N.Mex.
DETECTION BY AUGER ELECTRON SPECTROSCOPY AND REMOVAL BY OZONIZATION OF PHOTORESIST RESIDUES
P. H. Holloway and D. W. Bushmire 1974 26 p refs Presented at the Intern. Reliability Phys. Symp., Las Vegas, Nev. 2 Apr. 1974 Sponsored by AEC
(SLA-74-5238; Conf-740426-1) Avail: NTIS HC $4.50

Surface chemical analyses by Auger electron spectroscopy (AES) indicate that hydrocarbon residues are frequent contaminants on gold hybrid microcircuit metallization. The primary electron beam for AES cracks the hydrocarbon contaminants causing a carbonaceous residue. Lead frame bonding data demonstrated that a carbon residue approximately 10 A thick was indicative of thermocompression bond degradation. Concentrations of two percent ozones in oxygen can remove a photoresist layer approximately 200 A thick in 100 hours at room temperature. This restores thermocompression bondability of gold surfaces. Author (NSA)

N74-33614# Oak Ridge National Lab., Tenn.
APPLICATION OF INTEGRATED GAS CHROMATOGRAPHIC AND MASS SPECTROMETRIC METHODS IN THE IDENTIFICATION OF URINARY CONSTITUENTS ISOLATED BY LIQUID CHROMATOGRAPHY
J. E. Mrochek 1974 34 p refs Presented at the Symp. on Gas Chromatog.-Mass Spectrometry - A New Anal. Technol., Houston, Tex., 29 Jan. 1974 Sponsored by AEC
(Conf-740123-1) Avail: NTIS HC $4.75

Gas chromatographs (GC) and mass spectrometers (MS) are highly sensitive and discriminating analytical tools for structural investigations of organic molecules in physiologic fluids, although the ultimate utility of identification techniques employing these instruments is dependent on the development of necessary background data to enable meaningful interpretation of the complex GC and MS data obtained for natural products. Identification procedures utilizing GC and MS integrated with high resolution liquid chromatographic separation of physiologic fluids are described. Gas chromatographic and mass spectral characteristics which aid in their identification are discussed for trimethylsilyl derivatives of urinary sulfate and glucuronide conjugates. The integrated application of these analytical tools to practical identification problems involving urinary metabolites is illustrated with two examples. Author (NSA)

N74-33615# Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht (West Germany).
EXTENSION OF THE PHYSICAL CHARACTERISTICS PROGRAM FOR FREON 12
G. Rinne 1973 28 p refs In GERMAN
(GKSS-73-E-24) Avail: AEC Depository Libraries HC $3.50

To decrease costs of heat transfer measurements with water in the two-phase flow region, FREON 12 is often used as a model liquid. A computer program was written that calculates for the boiling and saturated steam curve and for the superheated region the values for density, enthalpy, entropy, and boiling pressure and now these values are extended to the liquid region. The specific heat, dynamic viscosity, thermal conductivity, and surface tension are included. NSA

N74-33616# Utah Univ., Salt Lake City. Div. of Materials Science and Engineering.
PREPARATION AND CHARACTERIZATION OF BIOCOMPATIBLE POLYMERS BY RADIATION GRAFTING AND RADIOISOTOPE TECHNIQUE Technical Progress Report, 15 Jun. 1973 - 22 Apr. 1974
D. J. Lentz and J. D. Andrade Apr. 1974 49 p refs
(Contract AT(11-1)-2147)
(COO-2147-12) Avail: NTIS HC $5.50

Progress in studies on the grafting of hydroxyethyl methacrylate (HEMA) monomer to various substrates for medical applications is reported. The HEMA monomer was analyzed for impurities and methods for purifying it were developed. A method for preparation of 2,3-dihydroxypropyl methacrylate (DHPMA) was developed. Grafting experiments were expanded to include both gas and solution phase grafting using UV radiation and radio-frequency glow discharge initiation. Data on the % weight increases of HEMA grafted to polypropylene in the solution phase using UV initiation are given. A pulsing diaphragm apparatus and a pressurized blister apparatus were built to test the mechanical behavior of the grafts. Tensile data indicate that the HEMA gel is much weaker than the tested supporting material, silastic rubber. Biological studies have been directed toward optimization of an ex vivo system designed for evaluation of the blood compatibility of substrate materials. NSA

N74-33617# R and D Associates, Santa Monica, Calif.
THE THERMODYNAMICS OF THE POLYSTYRENE-HYDROCARBON VAPOR SYSTEM
F. J. Krieger May 1973 43 p refs
(Contract DNA001-72-C-0197; DNA Proj. NWED-DB-001)
(AD-779905; RDA-TR-206-DNA; DNA-3254F) Avail: NTIS CSCL 07/3

The purpose of this study is the thermodynamic investigation of polystyrene over a range of temperatures up to 6000K and pressures up to 1000 atmospheres. Because polystyrene is subject to thermal breakdown and styrene has a relatively low boiling point (418.29K), only the gaseous phase was considered in determining the equilibrium compositions for the above parameters. The results of the computational program are presented in both tabular and graphic form. The latter is a conventional Mollier diagram in which specific enthalpy is plotted against specific entropy, with cross plots of temperature, pressure, and molecular weight. Author (GRA)

N74-33618# Aerospace Corp., El Segundo, Calif. Lab. Operations.
TRANSIENT POPULATIONS OF EXCITED STATES OF N2 UNDER PULSED DISCHARGE CONDITIONS Interim Report
David C. Cartwright and Nicholas A. Fiamengo 19 Jun. 1974 8 p refs
(Contract F04701-73-C-0074)
(AD-781785; TR-0074(9270-01)-7; SAMSO-TR-74-145) Avail: NTIS CSCL 07/4

The transient populations of three singlet and seven triplet excited electronic states of N2 are examined theoretically for pulsed discharge conditions. The singlet N2 laser processes are interpreted, and the possibility of new laser lines examined.
Author (GRA)

N74-33619# California Univ., Santa Barbara. Quantum Inst.
KINETIC STUDIES OF VIBRATIONALLY EXCITED HYDROGEN Final Report, 16 Mar. 1972 - 31 Dec. 1973
John M. Flournoy Feb. 1974 15 p refs
(Grant AF-AFOSR-2291-72; AF Proj. 9750)
(AD-781273; AFOSR-74-0992TR) Avail: NTIS CSCL 07/4

The enhanced reaction rate of vibrationally excited hydrogen in homogeneous, gas phase chemical proceases was studied. The flow system method that was employed, although capable of generation, detection, and measurement of H2 (v = 1) concentrations in the range from 0.01% to 1%, proved to be unsuitable for the study of homogeneous processes because of the unexpectedly rapid relaxation of the excited hydrogen against the walls of the apparatus. Nonetheless, some results were obtained which bear strongly on other work in similar systems.
Author

N74-33620# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE IGNITION OF ALUMINUM IN CARBON DIOXIDE GAS
Yu. A. Galchenko, Yu. M. Grigorev, and A. G. Merzhanov 17 Jun. 1974 12 p refs Transl. into ENGLISH from Fiz. Goreniya Vzryva (USSR), v. 9, no. 1, Jan./Feb. 1973 p 115-119
(AD-781624; FTD-HT-23-1241-74) Avail: NTIS CSCL 07/4

The ignition of aluminum wires in a medium of pure oxygen was studied by the electrothermographic method. It was shown that over the ignition induction period, an oxide film on the surface of the aluminum substantially increases its dimensions, while the ignition point of the wire can be significantly lower than the melting point alpha of the Al2O3 modification (the greatest deviation was about 400 deg). In the experiments a wire was placed in a long rectangular reactor and was subjected to gas flow at various rates. A filament of diameter d=50 micrometers was used. The conditions of heating corresponded to the constancy of the electric power generated in the tested sample.
Author

N74-33621# California Inst. of Tech., Pasadena. Div. of Chemistry and Chemical Engineering.
FUNDAMENTAL PROCESSES OCCURRING AT ELECTRODES Final Report, 25 Apr. 1963 - 30 Apr. 1974
Fred C. Anson 12 Jun. 1974 11 p refs
(Contract DA-31-124-ARO(D)-102; Grant DA-ARO(D)-31-124-71-G119)
(AD-781596; AROD-3406.31-C) Avail: NTIS CSCL 07/4

The report includes abstracts of papers resulting from research on electrode processes. Topics considered include adsorption, electrode surface reactions, electrode layers in solution, and kinetics of these processes.
GRA

N74-33622# Washington Univ., Seattle. Lab. for Chemometrics.
INVESTIGATION OF THE METAL CARBONYL BONDING PROBLEM BY PATTERN RECOGNITION Technical Report, Apr. - Jun. 1974
Douglas S. Dierdorf and Bruce R. Kowalski Jun. 1974 26 p refs
(Contract N00014-67-A-0103-0036; NR Proj. 051-565)
(AD-781291; TR-1) Avail: NTIS CSCL 07/4

The application of pattern recognition techniques is expanded to the analysis of bonding models. Supervised learning techniques are used to compare sigma and pi models of bonding in metal carbonyl systems. The three symmetry allowed c=O stretching frequencies and six other ligand and metal properties for each of 67 compounds of the type L-M (CO)5 provide evidence strongly supporting a sigma bonding model to explain variations in carbonyl stretching frequencies. Unsupervised learning techniques provided evidence that both models are inadequate but that carbonyl stretching frequencies may be predicted from simple ligand and metal properties.
Author

N74-33623# Rensselaer Observatory, Troy, N.Y. Materials Div.
STUDIES OF SURFACE REACTIONS USING ELECTRON-ABSORBATE INTERACTION TECHNIQUES: OXYGEN ABSORPTION ON Fe(110) Technical Summary Report, 1 Apr. 1973 - 31 Mar. 1974
John B. Hudson, William G. Dorfield, and Raymond Zuhr 1 Apr. 1974 67 p refs
(Contract N00014-67-A-0117-0016; NR Proj. 056-533)
(AD-781730; TR-2) CSCL 07/4

The interaction of molecular oxygen gas with a cleaned Fe(110) surface has been studied by a combination of static dosing and molecular beam dosing techniques. Results indicate that the initial adsorption process involves dissociative adsorption, following Langmuir-type kinetics. Initial sticking coefficient and saturation coverage are reported. Further oxygen uptake probably involves diffusion of iron atoms through the initial oxygen adlayer. Heating of the Fe(110) surface in oxygen results in an irreversible change in the nature of the surface. (Modified author abstract)
GRA

N74-33624# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
SYNTHESIS OF INTERCALATION COMPOUNDS AND NEW INORGANIC FLUORINE COMPOUNDS Final Report, 1 Jan. 1972 - 31 Aug. 1973
Richard J. Lagow and James L. Adcock May 1974 27 p
(Contract DAAB07-72-C-0166; DA Proj. 1T1-61102-A-34A)
(AD-780919; ECOM-0166-F-72) Avail: NTIS CSCL 07/2

Various organic and inorganic fluorine containing compounds were prepared and characterized. Each of these compounds contained substrate-fluorine bonds of varying strength and activity. Boron nitride, graphitized carbon black, paracyanogen, pyrolized polyacrylonitrile, graphite oxide, a series of polynuclear hydrocarbons (including phthalocyanine, tetracene and decacyclene, coronene and tribenz(a, c, h) phenazine), polyacrylonitrile, and polypropylene were fluorinated and tested for solubility in propylene carbonate and stability. (Modified author abstract)
GRA

N74-33625*# Case Western Reserve Univ., Cleveland, Ohio. Electrochemistry Research Lab.
RUTHENIUM OXIDE CATALYSTS FOR THE OXYGEN ELECTRODE
W. OGrady, C. Iwakura, J. Huang, and Ernest Yeager 1 May 1974 27 p refs
(Grant NGR-36-027-050; Contract N00014-67-A-0404-0006; NR Proj. 359-451)
(NASA-CR-140034; AD-779899; TR-37) Avail: NTIS HC $4.50 CSCL 07/4

The electrochemical properties of ruthenium oxide on Ti and other substrates have been examined using linear sweep voltammetry. The oxygen electrode kinetics have been studied in alkaline solutions on RuOx on Ti using principally the rotating disk technique. O2 reduction involves the formation of peroxide in the solution phase. O2 generation occurs at low overpotentials and the kinetics are characterized by a Tafel slope of 0.040V/decade and a first order dependence on OH concentration. Mechanisms are proposed to explain the experimental results.
Author (GRA)

N74-33626# Aerospace Corp., El Segundo, Calif.
THEORETICAL STUDIES ON N2 AND N2(+) Final Report, 15 Aug. 1972 - 30 Jun. 1973
David C. Cartwright and Nicholas A. Fiamengo 25 May 1974 81 p refs
(Contract F04701-73-C-0074)
(AD-781981; TR-0074(9270-01)-9; SAMSO-TR-74-144) Avail:

NTIS CSCL 07/4

The goals of this theoretical research are: (1) to determine a more accurate and consistent theoretical model of the excitation, emission, and deactivation properties of the N2(+) molecular band systems excited by electrons; (2) determine a consistent set of electron impact excitation cross sections for the electronic states of N2 over the range of incident electron energies that is relevant to understanding and predicting atmospheric processes; (3) with these excitation cross sections, perform the theoretical studies necessary to obtain a better understanding of the excitation, emission, and deactivation properties of the various N2 band systems excited in the normal and disturbed atmosphere. The following are discussed: the Meinel band system of N2(+); theoretical work leading to study of autoionization; electron-impact excitation of electronic states of N2; and, quadrupole moment and electric field gradient of N2 (X singlet Sigma(g)(+)). GRA

N74-33627# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

ROTATIONAL RELAXATION AND SELF-INDUCED TRANSPARENCY IN HF GAS Semiannual Report, 1 Mar. - 31 Aug. 1973

L. M. Peterson, G. H. Lindquist, and C. B. Arnold May 1974 38 p refs

(Contract DAAH01-73-C-0591)

(AD-782034; ERIM-101300-16-P) Avail: NTIS CSCL 07/4

The measurement of laser linewidth using time-resolved bleachable absorption of HF gas is reported. The pin lasers were found to have a width of only 3 MHz, which is 120 times narrower than the Doppler width of the lasing transition. The authors adopted a single-laser pump-probe technique whereby a single laser pulse of microsecond duration is broken into saturating pumping radiation followed by weak probing radiation using a Pockel's cell optical switch. Preliminary measurements of rotational relaxation times in HF at several tens of millitorr are presented for several $P^1(J)$ transitions: the values obtained are in agreement with values obtained from Lorentz pressure-broadening data. At a high incident laser intensity, the absorbing transition of the HF was saturated (bleached) and the later portions of the laser pulse passed without attenuation. In addition to this bleaching, transmitted pulses were obtained whereby the energy absorbed from the leading edge appeared later in the pulse. In portions of the transmitted pulse the energy actually exceeded that of the incident pulse and the net energy loss was anomalously small. At the highest laser intensities, damped oscillations were observed in the transmitted output. These anomalies are believed the result of self-induced transparency and optical nutations, respectively. (Modified author abstract) GRA

N74-33628# Ballistic Research Labs., Aberdeen Proving Ground, Md.

RATE COEFFICIENTS FOR THE CLUSTERING OF CO2, N2, AND O2 TO NO+ Final Report

J. M. Heimerl and J. A. Vanderhoff Apr. 1974 39 p refs

(DA Proj. 1T1-61102-B-53A)

(AD-781968; BRL-1710) Avail: NTIS CSCL 07/4

The rate coefficients for three-body, ion-neutral association have been measured at room temperature for the clustering of the atmospheric gases carbon dioxide, nitrogen and oxygen to the nitric oxide ion. Rates for collisional dissociation of the cluster ions are also reported. GRA

N74-33629*# North Carolina Univ., Chapel Hill. Materials Research Center.

RESEARCH ACTIVITIES IN THE FIELD OF MATERIALS SCIENCE Annual Technical Progress Report, 1 Jun. 1973 - 31 May 1974

31 May 1974 115 p refs Sponsored by NASA, AFOSR and AEC

(Contract DAHC15-73-G9; Grant NSF GH-33632)

(NASA-CR-140393; AD-782026) Avail: NTIS HC $8.75 CSCL 07/4

The report comprises brief summaries of materials research projects at the University of North Carolina at Chapel Hill for the year ending 31 May 1974. Included are a wide range of topics in chemistry and solid state physics. GRA

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N74-33630 AEG-Telefunken, Backnang (West Germany).

TELEVISION BROADCASTING SATELLITE PROJECT. FEASIBILITY ANALYSIS PHASE A. VOLUME 2: TECHNICAL REPORT [PROJEKT FERNSEHRUNDFUNKSATELL IT. DURCHFUEHRBARKEITSANALYSE PHASE A. ABSCHLUSSBERICHT BAND 2: TECHNISCHER BERICHT]

[1973] 272 p refs In GERMAN

(Contract RV-2/1-V-15/72-QH-01-00)

Copyright. Avail: Issuing Activity

The results of a feasibility analysis for a TV broadcasting satellite are reported. The mission was analyzed based on communication as well as space technology. Possible satellite concents are discussed. The subsystems, including the payload and the satellite operating system, are described. The ground system, covering home receiver installation, ground transmitter, and operating system, is detailed. ESRO

N74-33631 AEG-Telefunken, Backnang (West Germany).

HOME RECEIVER INSTALLATIONS FOR A TELEVISION BROADCASTING SATELLITE. COMPILATION AND ANALYSIS OF INFORMATION MATERIAL FROM THE USA AND JAPAN FOR LOW COST GROUND RECEIVING SYSTEMS [HEIMEMPFANFSANLAGEN FUER EINEN FERNSEHRUNDFUNKSATELITEN. ENDEERICHT DER STUDIE; ZUSAMMENSTELLUNG UND ANALYSE VON INFORMATIONSMATERIAL AUS DEN USA UND JAPAN FUER KOSTENGUENSTIGE BODENDEMPFANGSANLAGEN]

Diederich Koehn, Albert Nelson, and Fred Solzbacher 1973 93 p refs In GERMAN; ENGLISH summary

(Contract RV-2/1-V-22/73-QH-91-24-82)

Copyright. Avail: Issuing Activity

Available literature on satellite systems-home receiver installations was studied in order to establish how far developments elsewhere could be used for the planned German TV broadcasting satellite system in the construction of the associated home receivers. The result of the study is that, due to widely different parameters, none of the available installation types fits in with the German system, without far-reaching modifications. New concepts were established for the various installation types (individual-, community, and large community installations). The feasibility was analyzed, and the applicable components were specified. A cost estimate was made for the various concepts. ESRO

N74-33632*# Kanner (Leo) Associates, Redwood City, Calif.

VOLTAMMETRIC REDOX WAVE AT A STATIONARY ELECTRODE, 1

Gyorgy Farsang, Rozsondai Bela, and Tomcsanyi Laszlo Washington NASA Sep. 1974 25 p refs Transl. into ENGLISH from Magy. Kem. Foly. (Hungary), v. 76, no. 5, 1970 p 233-240

(Contract NASw-2481)

(NASA-TT-F-15918) Avail: NTIS HC $4.25 CSCL 09C

A theoretical treatment of the reversible voltammetric wave at a plane stationary electrode is given. The results of the calculation allowed construction of the theoretical current-potential curves of the redox waves. The quasi-reversible electron transfer process gave rise to greater differences with carbon paste electrode, and the sphericity of the electrode caused some slight differences in the case of a dropping mercury electrode. Author

N74-33633*# Computer Sciences Corp., Falls Church, Va.

DISASTER WARNING SYSTEM: SATELLITE FEASIBILITY AND COMPARISON WITH TERRESTRIAL SYSTEMS. VOLUME 3: APPENDICES

J. H. Spoor, W. H. Hodge, M. J. Fluk, and T. F. Bamford Sep. 1974 123 p refs

(Contract NAS3-17795)
(NASA-CR-134622; R-3015-3-1-Vol-3) Avail: NTIS HC $4.50 CSCL 17B

The Disaster Warning System (DWS) is a conceptual system which will provide the National Weather Service (NWS) with communication services in the 1980s to help minimize losses caused by natural disasters. A comparative analysis between a terrestrial DWS and a satellite DWS is reported. Baseline systems were synthesized in sufficient detail so that a comparison could be made in terms of performance and cost. The cost of both baseline systems is dominated by the disaster warning and spotter reporting functions. An effort was undertaken to reduce system cost through lower capacity alternative systems generated by modifying the baseline systems. By reducing the number of required channels and modifying the spotter reporting techniques, alternative satellite systems was synthesized. A terrestrial alternative with the coverage reduced to an estimated 95 percent of the population was considered. Author

N74-33634# Japan Broadcasting Corp., Tokyo.
DIGITAL SERVO CONTROL SYSTEM FOR VTR
Hironobu Katayama Apr. 1974 14 p refs
(NHK-Labs-Note-176) Avail: NTIS HC $4.00

Design philosophy and operational principles of the digital servo control system, which was developed with the object of improving the stability and reliability of the video tape recorder (VTR) and making it adjustment-free, have been introduced. Also included are the features of this system and the performances of prototype units applied to the broadcasting VTR. The prototype units resulted in good performance equal to the nventional analog control system, and there is hope of reducing the number of components to about 1/3 or even less. This system can be used not only for VTR's but for other purposes as well. It is necessary to establish a manufacturing technique for an all-purpose system through further studies aimed at using MSI's and LSI's for the circuitry. The intention is to continue with theoretical studies of differences between digital and analog control systems and to promote the establishment of a control technique entirely different from the conventional servo system. Author

N74-33635# Japan Broadcasting Corp., Tokyo.
INFLUENCE OF PROPAGATION CURVES ON THE COVERAGE FACTOR
Yoshio Suzuki, Jun-ichi Ujihara, Shiro Ehara, Shinji Yamanouchi, and Yoshinori Tozuka Jan. 1974 20 p refs
(NHK-Labs-Note-175) Avail: NTIS HC $4.00

Variations of the coverage factor c with the previous four types of propagation characteristics were examined. It was found that, in certain conditions, the shape of the curve c for the type of CAIRO (N/S) is different from that for the type of REP. 264-2. It is suggested that the coverage factor for sky-wave service under night-time conditions did not always reach in the same order to that for ground-wave service under day-time conditions in certain propagation curves by any large power transmitting. M.C.F.

N74-33636# Australian Post Office Research Labs., Melbourne.
AN EXPERIMENTAL BASEBAND 150 MBIT/S DIGITAL LINK OVER STANDARD COAXIAL CABLE
A. Y. C. Quan Feb. 1974 41 p refs
(Rept-6855) Avail: NTIS HC $5.25

A summary of the design and construction of an experimental baseband 150 Mbit/s digital transmission system over standard coaxial cable is reported. Also included are the experimental results of the system over a 2 km cable link. Author

N74-33637# Lockheed Missiles and Space Co., Palo Alto, Calif.
COHERENT-PULSE METHODS OF MOVING TARGET SELECTION, CHAPTER 6
M. I. Finkelshtein [1973] 18 p Transl. into ENGLISH from the book "Osnovy Radiolokatsii" Moscow, Sovetskoe Radio, 1973 p 294-319
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Pseudo-Coherent radars are an important modification of coherent-pulse radars. An incoherent probing signal is used in these systems, but storage of the initial phase of each pulse is accomplished. This permits elimination of the influence of a random initial phase in the reception of the reflected signal, and the conservation of just that phase change which occurs because of target motion. Storage of the initial phase is accomplished by means of stable reference harmonic oscillations filling almost the whole interval between the pulses whose initial phase agrees with the initial phase of the probing signal. Pseudo-coherent systems with external and internal coherece are distinguished. The reference signal in external coherence systems is produced because of reflection from fixed extended targets. The reference signal in internal coherence systems is shaped by using a special coherent heterodyne synchronized with the phase of the transmitter pulse. Coherent pulse methods are used in air target detection radars at airports and on tracks to separate moving from fixed targets. Author

N74-33638*# Kanner (Leo) Associates, Redwood City, Calif.
RADIATION CHARACTERISTICS OF MOIST GROUND IN THE ULTRA-HIGH FREQUENCY RANGE
A. Ye. Popov, Ye. A. Sharkov, and V. S. Etkin Washington NASA Oct. 1974 23 p refs Transl. into ENGLISH of "Izluchatelnyye Kharakteristiki Vlazhnykh Gruntov v SVCh Diapazone", Rept. Pr-170 Inst. of Space Res., USSR Acad. of Sci., Moscow, 1974 p 1-19
(Contract NASw-2481)
(NASA-TT-F-15966; Pr-170) Avail: NTIS HC $4.25 CSCL 17B

Detailed calculations were made of the emissivity and the coefficient of polarization of radio emission of moist ground in the wavelength range from 0.8 to 226 cm and with moisture content up to 30 percent. The calculations were based on experimental moisture functions of electrical parameters of the ground. The limits to the applicability of the approximation delta tg < 1 are indicated. The effect of atmospheric glow on the radiobrightness temperature and the coefficient of polarization of the radio emission of moist ground was examined. The wavelength range of 20-75 cm is optimal for the measurement of the moisture content. Author

N74-33639# Stevens Inst. of Tech., Hoboken, N.J.
REVIEW OF PARAMETRIC INSTABILITIES
G. Schmidt Nov. 1973 16 p refs Presented at AGARD-NATO Meeting, Edinburgh, Nov. 1973
(Contract AT(11-1)-3004)
(COO-3004-4; Conf-731135-1; SIT-271) Avail: NTIS HC $3.00

Parametric instabilities produced by electromagnetic waves propagating in a magnetic field-free plasma are reviewed. The discussion is based on the use of the ponderomotive force as the basic physical mechanism responsible for these instabilities. Decay of the electromagnetic wave into an electron and ion wave, the oscillating two stream instability, filamentation instability, simulated Raman and Brillouin scattering, resistive, and reactive quasi modes can all be treated in a unified fashion, in a uniform medium. If the plasma is bounded, the threshold power is non-zero even in the absence of damping, and may be the dominant factor in determining threshold and growth rate values. The threshold for stimulated Raman scattering increases in the presence of plasma density gradients, while temperature gradients have a similar effect on simulated Brillouin scattering. The finite cross section of the pump wave determines the undamped threshold for the filamentation instability.
Author (NSA)

N74-33640# Sandia Labs., Albuquerque, N.Mex.
SCATTERING OF AN ELECTRO-MAGNETIC WAVE BY AN INHOMOGENEOUS TURBULENT PLASMA
W. D. Brown Mar. 1974 46 p refs
(Contract AT(29-1)-789)
(SLA-73-1116) Avail: NTIS HC $4.50

A Born-eikonal formalism describing the scattering of an electromagnetic wave by an inhomogeneous turbulent plasma with a spacially varying electron collision frequency is described. The ensemble averaged properties of the plasma are taken into account in an eikonal approximation, while the fluctuating properties are treated by use of a perturbation series in which eikonal Green's functions describe the propagation between successive scatterings. A partial summation method which sums a larger class of perturbation terms than does the usual ladder

(bilocal) approximation is suggested. The conditions under which the Bethe-Salpeter equation for the two-point correlation of the electric field reduces to the transport equation are discussed. In order to illustrate numerically some of the formal considerations discussed in this report, the backscattering of microwaves by a random plasma slab was computed for a variety of values of the parameters characterizing the plasma and the microwaves.
Author (NSA)

N74-33641# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
COORDINATE INDEPENDENT GREEN'S DYADIC FOR GENERAL SYMMETRIC UNIAXIAL MEDIA
Ismo V. Lindell 1974 15 p refs Sponsored partly by Fulbright grant, and the Acad. of Finland
(S-61; ISBN-951-750-165-X) Avail: NTIS HC $4.00
Applying TE/TM partial field decomposition, dyadic formalism, and affine transformations, the Green's dyadic for the Helmholtz operator in a general symmetric uniaxial medium (magnetic and electric anisotropy symmetric and their quotient uniaxial dyadic) was evaluated in a coordinate-free explicit form. Author (ESRO)

N74-33642# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
THEORETICAL REDUCTION OF NOISE TEMPERATURE IN COOLED MILLIMETER WAVE MIXERS
A. Raeisaenen and M. Tiuri 1974 12 p refs
(S-62; ISBN-951-750-190-0) Avail: NTIS HC $4.00
Theoretical calculations of the effects of cooling on millimeter wave mixers (GaAs Schottky diode mixers) are presented. The mixer noise temperature and its reduction by cooling is dependent on the doping of the GaAs material. Theoretical noise temperature of an ideal mixer at 90 GHz can be less than 50 K. Theoretical results are compared to experimental ones given in the literature. Experimental noise temperatures are considerably higher, which is due to additonal conversion losses. As a result, cooling the mixer causes an even greater achievable noise temperature reduction. Author (ESRO)

N74-33643# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
[ACTIVITIES FOR THE ACADEMIC YEAR 1972 - 1973] Annual Report
Martti Tiuri 1974 28 p
(S-64; ISBN-951-750-231-1) Avail: NTIS HC $4.50
The annual activity report of the Radio Laboratory and its radio research station during the academic year from 1 August 1972 to 31 July 1973, is presented. The laboratory covers the following fields: electromagnetic theory, waves and antennas, microwave theory and technology, microwave applications, radio science and instrumentation, and laser applications. ESRO

N74-33644# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.
ON THE APPLICATION OF DISCRETE TRANSFORMATIONS FOR REDUNDANCY REDUCTION Ph.D. Thesis - Brunswick Univ.
Emil Sappl Porz 30 Jan. 1974 74 p refs In GERMAN; ENGLISH summary
(DLR-FB-74-15) Avail: NTIS HC $6.75; DFVLR, Porz, West Ger. 26,60 DM
A method of encoding discrete sources of information for redundancy reduction using code words with fixed length is presented. Considering a model of a linear encoded speech signal the method is compared with a zero order hold and with a Huffman encoding. The method in less efficient than the Huffman encoding but much more efficient than the zero order hold.
Author (ESRO)

N74-33645# Institut Franco-Allemand de Recherches, St. Louis (France).
A MINIATURIZED HYBRID TELEMETRY SYSTEM FOR DATA TRANSMISSION FROM MECHANICALLY HIGHLY LOADED BODIES [EIN MINIATURISIERTES HYBRIDES TELEMETRIE-SYSTEM ZUR DATENUEBERTRAGUNG AUS MECHANISCH HOCHBEANSPRUCHTEN KOERPERN]
G. Schultze 29 Mar. 1974 12 p In GERMAN Presented at the DFVLR Telemetry Conf., Munich, 23-25 Apr. 1974
(ISL-CO-4/74) Avail: NTIS HC $4.00
A miniature telemetry transmitter was developed for transmitting data on pressure, temperature, and vibration from projectiles. The device is capable of withstanding accelerations up to 100,000 g. After acceleration tests with various device technologies, the ceramic screen technology was adopted. The frequency range of the transmitter is 3 MHz to 3 GHz. ESRO

N74-33646# Terma Elektronisk Industri A/S, Lystrup (Denmark).
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF A DOUBLE-GRID MULTIBEAM REFLECTOR ANTENNA SYSTEM. VERIFICATION PHASE
Ole Soender 28 Jan. 1974 105 p refs Prepared jointly with Ticra Ltd.
(Contract ESTEC-1702/72-AA)
(TR-A-94; ESRO-CR(P)-470) Avail: NTIS HC $8.25
The main purpose was to verify the principle of the double-grid antenna and to verify that one of the numerical models could be used to predict the radiative principal and cross-polarized field. Verification was carried out on three test models of the antenna. The expected separation of the principal and the cross-polarized beams are observed for all the relevant combinations of reflectors and feeds. The numerical models can be used to calculate the principal field with very good accuracy, and also the level and position of the cross-polarization maxima. But the theory can only in certain cases predict the details of the cross-polarized field with reasonable accuracy. ESRO

N74-33647# Research Inst. of National Defence, Stockholm (Sweden).
STUDY AND DESIGN OF AN L-BAND DIPLEXER UTILISING HIGH DIELECTRIC RESONATOR TECHNOLOGY Final Report, 15 Feb. - 15 Apr. 1974
Jun. 1974 81 p refs
(Contract ESTEC-1818/72-HP)
(ESRO-CR(P)-482) Avail: NTIS HC $7.25
The design and construction of an L-band diplexer built with dielectric resonators of titanium dioxide are presented along with experimental results obtained on an engineering model. In addition, the development of a certain group of ceramics which should combine high dielectric permittivity and low loss with low temperature dependence is discussed. Author (ESRO)

N74-33648# Test Group (6585th), Holloman AFB, N.Mex.
STATIC RADAR CROSS SECTION OF LIGHT AIRCRAFT. VOLUME 1: CESSNA 150 L AT L-, S-, AND C-BANDS Final Report
Dec. 1973 284 p refs
(AD-781825; AFSWC-TR-73-46-Vol-1; FAA-RD-74-99-1) Avail: NTIS CSCL 17/9
Static radar cross section (RCS) of a single-engine Cessna 150L utility aircraft was measured at 2700, 2800, and 2900 MHz over a range of aircraft attitudes of plus or minus 10 degrees pitch, 0 degrees to 45 degrees roll, and also at 1250, 1350, 5000, and 5400 MHz at 0 degrees roll, 0 degrees pitch. Median RCS was independent of frequency in linear polarization but not in circular polarization. At S-Band the median RCS was nearly independent of roll and pitch except in the two broadside directions. In those two directions at roll angles between 20 degrees and 45 degrees median RCS was 6 db to 10 db greater when viewing the aircraft upper surface than when the radar aspect was into the lower surfaces of wing and fuselage at the same roll angle. Author (GRA)

N74-33649# Texas Univ., Austin. Electronics Research Center.
TWO-DIMENSIONAL DIGITAL FILTERING AND ITS ERROR ANALYSIS
Ming-Duenn Ni and J. K. Aggarwal 15 Mar. 1974 48 p refs
(Grants AF-AFOSR-2371-72; NSF GK-42790)
(PB-231923/4; TR-157) Avail: NTIS HC $3.25 CSCL 09D
The concept of a two-dimensional recursive digital filter is introduced and block diagram representations are given. Expressions for error bounds and mean-square error for roundoff error accumulation are derived. Other sources of error are described. Simulation of the implementation of digital filters is discussed, and corresponding to this simulation, calculation of error is

performed. Numerical examples are given. The derived analytic results are shown to be in good agreement with the simulation results. Author (GRA)

N74-33650# California Univ., Los Angeles. School of Engineering and Applied Science.
PACKET SWITCHING IN A MULTI-ACCESS BROADCAST CHANNEL WITH APPLICATION TO SATELLITE COMMUNICATION IN A COMPUTER NETWORK
Simon S. Lam Apr. 1974 308 p refs
(Contract DAHC15-73-C-0368)
(AD-781276; UCLA-ENG-7429) Avail: NTIS CSCL 17/2

The report considers a packet switching technique applicable to packet communication using a satellite or ground radio channel. The objective of this research is to develop analytic models for the evaluation and optimization of the system performance in terms of stability, throughput and delay. Advantages of packet switched satellite and ground radio systems over conventional wire communications for large computer-communication networks are discussed. The emphasis of this research is on a high-speed channel shared by a large population of small users. The channel behavior is typical of contention systems in which the throughput vanishes to zero as the load on the system increases. This phenomenon is called channel saturation. The channel may go into saturation as a result of (a) time fluctuations, and (b) stochastic fluctuations in the channel input. The channel response to time varying inputs is first studied using a deterministic approximation analysis. The effect of (b) is then studied through probabilistic models. (Modified author abstract) GRA

N74-33651# General Dynamics Corp., San Diego, Calif. Electronics Div.
PASSIVE LOCATION OF AN AIRBORNE TRANSMITTER BY MICROWAVE HOLOGRAPHY Final Report
E. L. Rope, G. Tricoles, and O. C. Yue May 1974 100 p refs
(Contract N00019-73-C-0346)
(AD-781772; R73-047-4) Avail: NTIS CSCL 17/3

The report describes research on a new technique for passively locating an airborne microwave source from another aircraft. The technique is holography. The new aspect is that holograms are formed on a dielectric slab of finite breadth. The mechanism is interference between an incident plane wave and a slab-guided wave excited by an edge. This technique is new because the reference field is generated at the hologram; consequently, for a single source coherence length need be only that of the slab. The technique suggests microwave integrated optics. The location of an airborne source is difficult when ranges are long if the sea surface reflects; that is, multipath introduces errors in conventional aperture systems. Consequently, long baseline interferometers and sampling arrays are plausible. However, the report describes laboratory experiments on a longitudinal sensor which is flat and therefore somewhat more natural for aircraft installation than an array transverse to the flight path. GRA

N74-33652# Test Group (6585th), Holloman AFB, N.Mex.
STATIC RADAR CROSS SECTION OF LIGHT AIRCRAFT. VOLUME 2: CHEROKEE 140 AT L-, S-, AND C-BANDS Final Report
Dec. 1973 265 p Prepared in cooperation with Dynalectron Corp.
(Contract F29601-73-C-0133)
(AD-781791; AFSWC-TR-73-46-Vol-2) Avail: NTIS CSCL 17/9

Static radar cross section (RCS) of a single-engine low-wing Piper PA-28-140 Cherokee (Cherokee 140) was measured at 2700, 2800, and 2900 MHz (S-Band) over a range of aircraft attitudes of plus or minus 10 degrees pitch, 0 degrees to 45 degrees roll, and also at 1250, 1350, 5000, and 5400 MHz at 0 degrees roll, 0 degrees pitch. Median RCS in circular polarization and in linear polarization was independent of frequency. At S-Band the median RCS varied with roll angle most strongly in the two broadside directions. In those two directions the variation was greatest for linear polarization when the radar viewed the lower surface of the aircraft, and was greatest for circular polarization when the radar viewed the upper surface of the aircraft. Median RCS at S-Band was not affected by pitch angle. Author (GRA)

N74-33653# Test Group (6535th), Holloman AFB, N.Mex.
STATIC RADAR CROSS SECTION OF LIGHT AIRCRAFT. VOLUME 3: PIPER PA-18 SUPER CUB AT L-, S-, AND C-BANDS Final Report
Jan. 1974 269 p refs
(AD-781792; AFSWC-TR-73-46-Vol-3) Avail: NTIS CSCL 17/9

Static radar cross section (RCS) of a single-engine fabric-covered Piper PA-18 Super Cub high wing monoplane was measured at 2700, 2800 and 2900 MHz over a range of aircraft attitudes of plus or minus 10 degrees pitch, 0 degrees to 45 degrees roll, and also at 1250, 1350, 5000, and 5400 MHz at 0 degrees roll, 0 degrees pitch. Median RCS was independent of frequency in linear polarization and in circular polarization. The RCS was insensitive to roll, pitch, and yaw except in the two broadside directions under conditions of increasing roll angle. The report includes copies of the original recorded RCS patterns. Author (GRA)

N74-33654# Linkabit Corp., San Diego, Calif.
TROPOSCATTER CONVOLUTIONAL ENCODER-VITERBI DECODER Semiannual Research and Development Technical Report, 28 Jun. 1973 - 1 Feb. 1974
Andrew R. Cohen and Jerrold A. Heller Jun. 1974 60 p
(Contract DAAB07-73-C-0248; DA Proj. 17-62701-AH-92)
(AD-781573; ECOM-0248-1-73; SATR-1) Avail: NTIS CSCL 17/2

The objective of the program is the development of a device to lower the bit error rate of a troposcatter channel by correcting errors which occur between the transmission and reception of the digital signal. The decoder is capable of accepting; (1) an analog signal from which a three-bit parallel soft decision (eight-level quantization) can be made or, (2) a one-bit hard decision type signal. The interleaver/deinterleaver concept is to be employed to enhance system performance during periods of signal fading while in the hard decision mode of operation. GRA

N74-33655# Naval Research Lab., Washington, D.C.
A DETECTOR DESIGN FOR THE SPS-10 RADAR Interim Report
B. H. Cantrell, G. V. Trunk, and F. D. Queen 19 Jun. 1974 22 p refs
(NRL Proj. R02-54; RF12151403)
(AD-781870; NRL-7734) Avail: NTIS CSCL 17/9

An automatic detector to be used with the SPS-10 radar was designed. The parametric detector consists of a 2-pole video integrator and uses an adaptive threshold. The threshold is set by obtaining an estimate of the mean and variance from the surrounding region (range and azimuth) of the sample under test. The operating characteristics of the detector are presented for both thermal noise and clutter conditions. Author (GRA)

N74-33656# Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPTIMUM DETECTORS OF PSEUDONOISE WAVEFORMS
Steven L. Bernstein 19 Jun. 1974 20 p
(Contract F19628-73-C-0002; AF Proj. 1508A)
(AD-781800; TN-1974-37; ESD-TR-74-225) Avail: NTIS CSCL 17/2

The note considers the problem of detecting the presence of pseudonoise waveforms. The detector is assumed to have no knowledge of the sequence providing the pseudorandom phase shift keying. It is found that the structure and performance of the optimum detector is nearly the same as a radiometer detector with proper prefiltering. In the special, but important, case when the received phase of a binary pseudonoise signal is constant over the detection interval it is found that the optimum detector performance is 3 db better than the radiometric detector. Author (GRA)

N74-33657# Air Force Human Resources Lab., Brooks AFB, Tex.
COMPRESSED SPEECH: POTENTIAL APPLICATION FOR AIR FORCE TECHNICAL TRAINING Final Report, Aug. - Nov. 1973
K. Anne Dailey Apr. 1974 19 p refs
(AF Proj. 1121)
(AD-781754; AFHRL-TR-74-27) Avail: NTIS CSCL 17/2

Time-compressed speech (also denoted as compressed speech, speeded speech, or accelerated speech) is an extension of the normal recording procedure for reproducing the spoken word. Compressed speech can be used to achieve dramatic reductions in listening time without significant loss in comprehension. The implications of such temporal reductions in the educational setting are that time savings can be used functionally to review, repeat or extend the material which was originally presented. This report includes a definition and description of compressed speech techniques as they have been evolved, a discussion of certain methodological issues engendered by the current literature, a summary of selected literature (grouped by system topics), and a discussion of current and potential studies, possible applications, and general recommendations concerning the impact of compressed speech on technical training in the Air Force. Author (GRA)

N74-33658# North Carolina Univ., Chapel Hill. Dept. of Statistics.
BRANDLIMITED PROCESSES AND CERTAIN NONLINEAR TRANSFORMATIONS Interim Report
Elias Masry and Stamatis Cambanis Feb. 1974 32 p refs
(Contract N00014-69-A-0200-6037; Grant AF-AFOSR-2386-72; AF Proj. 9769)
(AD-780585; Mimeo-Ser-912; AFOSR-74-0895TR) Avail: NTIS CSCL 09/4

The paper considers the problem of the uniqueness and invertibility of a certain class of nonlinear transformations acting on stochastic signals. The transformation consists of an instantaneous nonlinearity followed by a bandlimiting linear system and the input is a bandlimited process in the sense of Zakai. For Gaussian, possibly noisy, inputs and a large class of nonlinear systems it is shown that there is one to one correspondence between the input and the output. As an application some new results on the curve crossings of bandlimited Gaussian processes are derived. Furthermore the sample functions of the input process are reconstructed from, possibly noisy, observations of the output process for a specific class of nonlinearities followed by a variety of linear systems. Author (GRA)

N74-33659# Air Force Systems Command, Wright-Patterson AFB, Ohio.
RADIATION AND PROPAGATION OF ELECTROMAGNETIC WAVES IN AN ANISOTROPIC MEDIUM
A. I. Potekhin 22 May 1974 69 p refs Transl. into ENGLISH from an unidentified Russian monograph
(AD-781219; FSTC-HT-23-1662-73) Avail: NTIS CSCL 20/14

In the work a systematic exposition is given of problems in the propagation of electromagnetic waves emitted by a sheet of current, an infinitely long filament, or an elementary dipole, in a uniaxial anisotropic medium. The field is calculated at an arbitrary distance from the source by rigorous methods. The orientation of the filament of current or the axis of the dipole is assumed to be parallel to or perpendicular to the axis of anisotropy. All problems are solved by a single method, in which the physical meaning remains clear at every stage of the calculation. In all cases considered the solution is given in closed form (plane, cylindrical, conical, and quasi-spherical waves are considered). GRA

N74-33660# McDonnell Aircraft Co., St. Louis, Mo.
A NON-LINEAR LENS FOR BANDWIDTH REDUCTION IN MILITARY TV SYSTEM APPLICATIONS Final Report, 12 Jan. - 12 Oct. 1973
R. D. Helmick, R. W. Fisher, and G. Licis 12 Nov. 1973 58 p refs
(Contract N00014-73-C-0154; NR Proj. 320-423)
(AD-781834) Avail: NTIS CSCL 17/2

Laboratory evaluation of a prototype non-linear lens indicates that the image quality (primarily resolution) are comparable to that expected from the design data. The lens exhibits angular resolution capability which is better than that obtained from the eye acuity function. Author (GRA)

N74-33661# Clarkson Coll. of Technology, Potsdam, N.Y.
ANALYSIS AND DESIGN OF SWITCHING COMPONENTS FOR A TDM COMMUNICATION SYSTEM
Rangaswamy Mukundan and Kenneth K. Jackson Mar. 1974 135 p refs
(Contract F30602-72-C-0463)
(AD-781185; RADC-TR-74-32) Avail: NTIS CSCL 17/2

In modern communication systems, expansion of facilities without increases in cost or size of plant is a goal. Time Division Multiplexing (TDM) can achieve this goal by using sophisticated hardware. Improvements in signal path components such as contacts, filters, and gate driving circuitry give the desired level of sophistication. JFET technology is shown to be useful for contact circuits, while giving good transmission performance. PCAP (Princeton Circuit Analysis Program) simulation and hardware modelling are used to illustrate and substantiate Resonant Transfer TDM concepts. The purpose is to propose elements of a TDM switch meeting future requirements using the work accomplished here as a basis. The system serves 256 lines per highway and is integrated circuit oriented. Capacity is estimated at 2048 lines. Author (GRA)

N74-33662# Illinois Univ., Urbana.
AN ELECTRONIC SPEECH SYNTHESIZER UTILIZING STORED PERIODIC WAVEFORMS AND CERTAIN STORED CONTROLLING INFORMATION TO REDUCE INPUT BANDWIDTH REQUIREMENTS Final Report
James H. Parry and Frederick A. Ebeling 19 Sep. 1973 14 p
(Contract NSF C-723)
(PB-232294/9; NSF-74-19-C-723) Avail: NTIS HC$4.00 CSCL 17B

The report describes a device capable of producing understandable speech sounds when properly controlled by a computer or order source of information. The nature of the controlling information exhibits three important aspects: (1) it permits economical storage of spoken messages or parts thereof within the computer; (2) it permits algorithmetic treatment of the words to accomplish modification of meaning and modification of pronounciation of the purpose of generating natural sounding speech from a small vocabulary of words; and (3) it permits low bandwidth transmission of the spoken messages from the computer to the synthesizer. GRA

N74-33663# Stanford Univ., Calif. Dept. of Electrical Engineering and Computer Science.
QUEUEING EQUAL LENGTH MESSAGES IN A LOGARITHMIC NETWORK
Maurice Schlumberger May 1974 75 p refs
(Grant NSF GJ-41093)
(PB-232597/5; SU-STAN-CS-74-426; TR-82) Avail: NTIS HC $6.75 CSCL 17B

The author studies the transmission of equal length messages in a network with logarithmic diameter in which nodes have infinite buffering. When the destination addresses are random and uniformly distributed over the nodes of the network, and when the control delay is not zero at the nodes traversed by a message, the minimum amount of time needed to transmit n messages in a network with n nodes is of the order of (log of n to the base d) where 2.d is the degree of the network graph. If the control delay is zero, this measure becomes (log of n to the base d) to the 2/3 power). Changing the number of messages that a node can receive or send simultaneously does not change the order of magnitude of the result. GRA

N74-33664# Stanford Univ., Calif. Dept. of Electrical Engineering and Computer Science.
VULNERABILITY OF DE BRUIJN COMMUNICATIONS NETWORKS
Maurice Schlumberger May 1974 68 p refs
(Grant NSF GJ-41093)
(PB-232598/3; SU-STAN-CS-74-425; TR-81) Avail: NTIS HC $3.75 CSCL 09D

The report studies de Bruijn communications networks with faulty nodes. A de Bruijn communications networks is a communications network based on a de Bruijn graph. The author shows a method for messages to by-pass a faulty node in at most six steps when the out-degree d of the network is larger than two, or when the number of nodes n in the network is a multiple of (d sup 2). In general less than 2. (d sup 2) nodes have less than 2.d distinct neighbors. Let the connectivity of the network be the minimum number of nodes that need to fail

for the network to become disconnected. The connectivity of an unoriented de Bruijn network is at least d-1. If n = (d sup k), for some integer k, the connnectivity of the unoriented network is at least d and that of the oriented network is d-1. GRA

N74-33665# Washington Univ., St. Louis, Mo. Lab. for Applied Electronic Sciences.
OPTICAL COMMUNICATION SYSTEMS
William S. C. Chang and Donald L. Snyder Nov. 1973 155 p refs Presented at the NSF Grantee-User Meeting, St. Louis, 14-15 Nov. 1973; Sponsored by NSF Sponsored by NSF
(PB-232767/4) Avail: NTIS HC $5.00 CSCL 17B

A semi-annual meeting of the NSF grantee-users group in optical communications systems was held. An important objective of these meetings is to provide an interchange among grantees and to encourage the interaction of grantees with potential users in industry and government. The report includes technical discussions from grantees on direct detection receivers, communication in the turbulent atmosphere, integrated optics and discrete devices for detection, multiplexing and generation. Invited papers from users discuss the USAF developments in space laser communications, current and emerging opportunities in optical communications and military applications of fibers and integrated optics. GRA

N74-33666# Transportation Systems Center, Cambridge, Mass.
COMMUNICATION SYSTEMS FOR DUAL MODE TRANSPORTATION Final Report, Apr. - Jun. 1973
R. E. Eaves and R. D. Kodis Feb. 1974 44 p refs
(PB-231907/7; DOT-TSC-UMTA-73-13; UTMA-MA-06-0029-73-1) Avail: NTIS HC $3.25 CSCL 17B

The communications requirements of dual mode transportation systems are discussed for both the on-guideway and off-guideway modes. Candidate communication systems are classified according to their principle of operation, and the characteristics of the systems are described. The suitability of these systems is assessed on the basis of dual mode requirements, FCC restrictions, and physical and electrical limitations. GRA

N74-33667# Battelle Columbus Labs., Ohio.
OPTIMAL SITE DEPLOYMENT PATTERN FOR TRACKING TARGETS WITH MINIMAL ERROR Final Report
Boghos D. Sivazlian and Robert E. Green Sep. 1973 83 p refs
(Contract DAHC04-72-A-0001; DA Proj. 1U2-65302-D-240) (AD-781943; STEWS-ID-73-3) Avail: NTIS CSCL 17/9

Accurate estimates of Cartesian coordinates of a target using any of the existing range instrumentation systems depend, in general, on such factors as target position, number of instruments, their location, their accuracy and their mix. The present report analyzes the problem of site deployment pattern of instrument systems, and develops a method for selecting an optimal theoretical configuration of stations for cinetheodolites (telescopes), DOVAP's and radars, respectively, to minimize target position. It assumes that the target is stationary and is approximately symmetrically located relative to the sites of the tracking instrument. Optimal elevation angles are derived, and mathematical expressions relating TPU to the various interplaying parameters are obtained. Author (GRA)

N74-33668# Naval Postgraduate School, Monterey, Calif.
HIGH NOISE LEVEL MICROPHONES USED IN AIRCRAFT M.S. Thesis
Edward Joseph Hintz, Jr. Jun. 1974 38 p refs
(AD-782308) Avail: NTIS CSCL 09/1

The objective of this paper is to do a comparative analysis of three of the present state of the art high noise level microphones. They are the M-87/AIC and M-87/AIC- (EV 693) both made by Electro-Voice and the HNL bone conduction microphone made by SETCOM Corporation. The advantages and disadvantages of using a bone conduction microphone over a boom mounted microphone are also investigated. Author (GRA)

N74-33669# Naval Postgraduate School, Monterey, Calif.
AN APPLICATION OF NONLINEAR FILTERING THEORY TO PASSIVE TARGET LOCATION AND TRACKING M.S. Thesis
George William Mitschang Jun. 1974 206 p refs
(AD-782305) Avail: NTIS CSCL 17/9

The technique of Extended Kalman filtering is applied to a passive single sensor location and tracking problem. Signal angle of arrival and Doppler shifted frequency are used as observations for two different filter formulations: one for fixed X-Y coordinates of position and velocity and one with an orthogonal system rotated to align an axis with the target heading. The fixed X-Y system was found to give better tracking performance on the Monte Carlo simulation. A new method of calculating the initial covariance matrix was extended to reformulate the Kalman filter equations for a nonlinear problem. (Modified author abstract) GRA

N74-33670# Washington Univ., Seattle. Dept. of Electrical Engineering.
PROPAGATION CHARACTERISTICS OF A PULSE WAVE IN A DISCRETE TIME VARYING RANDOM MEDIUM
Akira Ishimaru and S. T. Hong Mar. 1974 41 p refs
(Contract F19628-74-C-0005; AF Proj. 8682)
(AD-782029; TR-176; AFCRL-TR-74-0196; SR-1) Avail: NTIS CSCL 20/14

The propagation characteristics, coherence time, coherence bandwidth, and pulse waveform of a wave passing through a discrete time-varying random medium are considered in the report. They are formulated based on Foldy-Twersky theory. Using its first order solution, explicit expressions are given for plane, spherical and beam waves. These expressions apply to the cases of small transmitting bandwidths and/or short propagation distances. Numerical calculations are made for mm plane and spherical waves propagated through rain. (Modified author abstract) GRA

N74-33671# Washington Univ., Seattle. Dept. of Electrical Engineering.
PLANE WAVE PULSE PROPAGATION THROUGH ATMOSPHERIC TURBULENCE AT MM AND OPTICAL WAVELENGTHS
Ippalapalli Sreenivasiah and Akira Ishimaru Mar. 1974 60 p refs
(Contract F19628-74-C-0005; AF Proj. 8682)
(AD-782030; TR-177; SR-2; AFCRL-TR-74-0205) Avail: NTIS CSCL 20/14

Starting from the parabolic equation for a wave propagating in a random medium, the equation for the general mutual coherence function is derived, and a solution is obtained for the same using a perturbation technique, assuming the Kolmogorov spectrum for the fluctuations of the refractive index. It is shown that the solution so obtained is exact when the coherence function is evaluated at a single point and at the same time, but at two different frequencies. Using this exact solution for the two frequency correlation function, the propagation characteristics of a plane wave Gaussian and rectangular pulses are studied at mm and optical wavelengths. (Modified author abstract) GRA

N74-33672# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PHYSICAL LIMITATIONS ON INTERFERENCE REDUCTION BY ANTENNA PATTERN SHAPING
Joseph T. Mayhan and Leon J. Ricardi 19 Jun. 1974 41 p refs
(Contract F19628-73-C-0002; AF Proj. 1508A)
(AD-782229; TN-1974-34; ESD-TR-74-223) Avail: NTIS CSCL 17/2

The note addresses the problem of nulling out an interfering noise source by appropriately modifying the antenna radiation pattern. It considers two complementary, one-dimensional antenna structures, i.e., a circumferentially symmetric line source of length a, and an axially independent cylindrical antenna of radius rho sub o. The authors consider first the case of N discrete noise sources and compute the loss in antenna directivity (and subsequent loss in signal/noise ratio) when the radiation pattern is modified so as to place a null at each angular position of the interfering noise source. The results indicate that if all noise sources are outside the main beam, the loss in directivity is negligible. When one or more noise sources are in the main beam, the antenna directivity can be reduced appreciably. It is shown that when uniformly distributed noise is superimposed over the discrete noise, the same antenna pattern maximizes the signal/noise ratio for those practical cases when the discrete

noise source power is significantly greater than the uniformly distributed noise source. Author (GRA)

N74-33673# Stanford Univ., Calif. Dept. of Electrical Engineering and Computer Science.
LOGARITHMIC COMMUNICATIONS NETWORK
Maurice Schlumberger May 1974 38 p refs
(Grant NSF GJ-41093)
(PB-232602/3; STAN-CS-74-424) Avail: NTIS HC $3.25 CSCL 17B

Most communications networks have a small number of ports or long transmission delays. The author generalizes the notion of de Bruijn graphs in order to construct large networks with short transmission delays, and with as few interconnections as possible. They are characterized by d, the number of connections leaving a node, and n, the number of nodes in the network. It is shown that the access time to any node is proportional to (log of n to the base d), and scheme is given to route messages by using only (log of n to the base d) control digits. This routing scheme does not require global control, but rather requires only local control at the nodes on the path between source and destination nodes. GRA

N74-33674# Fleet Missile Systems Analysis and Evaluation Group Annex, Corona, Calif.
WIDEBAND HIGH-SPEED DATA RATE RECORDING CONCEPTS AND SYSTEMS Final Report
Jack Lustig and Dominick Costabile Jun. 1974 168 p refs
(AD-782368) Avail: NTIS CSCL 17/2

The report is the result of a study to investigate the state-of-the-art of wide band, high speed data rate recording and transmission technology. The objectives of the assignment are: Discover hardware capable of recording in the multi-megabit range; Reduce costs through location of new techniques or hardware that can be adapted to the present system; Examine new high density techniques (i.e. holography, lasers, etc.); Investigate high access capability; Look into condensation of data and transference to other media; and, Explore the availability of high data rate and high capacity operational equipment. (Modified author abstract) GRA

N74-33986* Joint Publications Research Service, Arlington, Va.
SHORTWAVE TELEMETRIC SYSTEM
K. K. Valenchuk, V. V. Shcherbakov, and V. A. Yefremkin *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 59-65 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 7 p (For availability see N74-33976 23-15)
CSCL 17B

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N74-33675*# Intermetrics, Inc., Cambridge, Mass.
HAL/S-360 COMPILER TEST ACTIVITY REPORT
Carl T. Helmers 3 Jul. 1974 68 p
(Contract NAS9-13864)
(NASA-CR-140278; IR-86-1) Avail: NTIS HC $6.50 CSCL 09B

The levels of testing employed in verifying the HAL/S-360 compiler were as follows: (1) typical applications program case testing; (2) functional testing of the compiler system and its generated code; and (3) machine oriented testing of compiler implementation on operational computers. Details of the initial test plan and subsequent adaptation are reported, along with complete test results for each phase which examined the production of object codes for every possible source statement. A.A.D.

N74-33676*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ASSESS PROGRAM: INTERACTIVE DATA MANAGEMENT SYSTEMS FOR AIRBORNE RESEARCH
Robert M. Munoz and John O. Reller, Jr. Aug. 1974 46 p refs
(NASA-TM-X-62367) Avail: NTIS HC $3.25 CSCL 09B

Two data systems were developed for use in airborne research. Both have distributed intelligence and are programmed for interactive support among computers and with human operators. The C-141 system (ADAMS) performs flight planning and telescope control functions in addition to its primary role of data acquisition; the CV-990 system (ADDAS) performs data management functions in support of many research experiments operating concurrently. Each system is arranged for maximum reliability in the first priority function, precision data acquisition. Author

N74-33677*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SYSTEM SUPPORT SOFTWARE FOR THE SPACE ULTRA-RELIABLE MODULAR COMPUTER (SUMC)
T. E. Hill, G. C. Hintze, B. C. Hodges, F. A. Austin (Computer Sci. Corp.), B. P. Buckles (Computer Sci. Corp.), R. T. Curran (Computer Sci. Corp.), J. D. Lackey (Computer Sci. Corp.), and R. E. Payne (Computer Sci. Corp.) 23 Sep. 1974 41 p refs
(NASA-TM-X-64878) Avail: NTIS HC $3.25 CSCL 09B

The highly transportable programming system designed and implemented to support the development of software for the Space Ultrareliable Modular Computer (SUMC) is described. The SUMC system support software consists of program modules called processors. The initial set of processors consists of the supervisor, the general purpose assembler for SUMC instruction and microcode input, linkage editors, an instruction level simulator, a microcode grid print processor, and user oriented utility programs. A FORTRAN 4 compiler is undergoing development. The design facilitates the addition of new processors with a minimum effort and provides the user quasi host independence on the ground based operational software development computer. Additional capability is provided to accommodate variations in the SUMC architecture without consequent major modifications in the initial processors. Author

N74-33678*# National Aeronautics and Space Administration, Washington, D.C.
COMPUTER PROGRAMS: SPECIAL APPLICATIONS. A COMPILATION Technology Utilization
[1974] 20 p refs
(NASA-SP-5967(02)) Avail: NTIS HC $1.00 CSCL 09B

Computer programs are reported of technological developments in: management techniques, measurements and testing programs, and navigation and tracking programs. Machine requirements, program language, and the reporting source are included for the dissemination of information. M.C.F.

N74-33679# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
COST ANALYSIS FOR COMPUTER COMMUNICATIONS Final Report, Jul. - Oct. 1973
Robert P. Blanc Sep. 1974 40 p refs
(Grant NSF AG-350)
(NBS-TN-845; LC-74-600140) Avail: SOD HC $0.75 as C13.46:845

A communication cost study relevant to the needs of the NSF Networking for Science Program is summarized. The primary purpose of this report is to provide an approximation to the communications costs of connecting a specified number of host computers in selected locations with a specified number of interactive user terminals. Cost factors from existing, proposed and modeled value-added networks are applied to hypothetical traffic demands to arrive at cost estimates. Author

N74-33680# National Bureau of Standards, Washington, D.C. Systems and Software Div.
A TECHNICAL GUIDE TO COMPUTER-COMMUNICATIONS INTERFACE STANDARDS
Albrecht J. Neumann, Brian G. Lucas, Justin C. Walker, and Dennis W. Fife Aug. 1974 115 p refs Sponsored by Defense Commun. Agency
(NBS-TN-843; LC-74-600131) Avail: SOD HC $1.50 as

C13.46:843

A technical summary and guide is given for existing and forthcoming Federal and National standards on data communications pertinent to computer networking. Selected international standards and industry practices are included for completeness. Prepared to assist the application of standards within the World Wide Military Command and Control System, this handbook should be useful to all ADP system designers interested in uniform data terminal interfaces, character sets and codes, keyboard arrangements, and communications line disciplines for effective message exchange between computers. Author

N74-33681# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Tech.
APPROACHES TO PRIVACY AND SECURITY IN COMPUTER SYSTEMS Final Report
Clark R. Renninger Sep. 1974 84 p refs Conf. held at Gaithersburg, Md., 4-5 Mar. 1974
(NBS-SP-404) Avail: SOD HC $1.20 as C13.10:404

To protect confidential information in computer system, proposals are presented for meeting governmental needs in safeguarding individual privacy and data confidentiality that were identified at a conference held in November 1973. Among the proposals are the enactment of privacy legislation, improved computer system architecture and access controls, information and security management guidelines and the development of a systematic, balanced approach to system security. Author

N74-33682# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
COMPUTER PERFORMANCE EVALUATION Final Report
Harold Joseph Highland Sep. 1974 150 p refs Presented at 8th Meeting of Computer Performance Evaluation Users Group (CPEUG), Gaithersburg, Md., 4-7 Dec. 1973; sponsored in part by Army Computer Systems Command
(NBS-SP-401; LC-74-13113) Avail: SOD HC $1.80 as C13.10:401

The proceedings of a conference on the evaluation of computer performance are presented. The subjects discussed are: (1) initiating computer performance evaluation, (2) accounting packages, (3) software monitors, (4) hardware monitors, (5) specific experiences in computer evaluation, and (6) a case study in monitoring the CDC 6700 computer system. Additional subjects considered are data analysis techniques applied to performance measurement data and a simulation model of an autodin automatic switching center communications data processor. For individual titles, see N74-33683 through N74-33700.

N74-33683 Air Force Dept., Washington, D.C. Federal Computer Performance Evaluation and Simulation Center.
GETTING STARTED IN COMPUTER PERFORMANCE EVALUATION
Philip J. Kiviat and Michael F. Morris *In* NBS Computer Performance Evaluation Sep. 1974 p 5-13 (For availability see N74-33682 23-08)

The circumstances which indicate the necessity for a computer evaluation program are defined. The principal reason for conducting a computer evaluation program is the addition of another set of applications to an operating computer system. The selection and organization of the team of personnel to conduct the evaluation are discussed. The procedures for conducting the evaluation are explained to include: (1) project administration, (2) project management, (3) learning techniques, (4) a flow chart for evaluation, and (5) special considerations and financial aspects. Author

N74-33684 Mitre Corp., McLean, Va.
A METHODOLOGY FOR PERFORMANCE MEASUREMENT
Daniel M. Venese *In* NBS Computer Performance Evaluation Sep. 1974 p 15-22 refs (For availability see N74-33682 23-08)

A methodology for conducting computer system performance evaluations is presented. The underlying assumptions of the evaluation methodology are identified. The aim of the methodology is to account for the significant factors that affect a performance evaluation effort. Specific problems associated with software and hardware are examined. The development and application of a test hypothesis for insuring complete evaluation are explained. Author

N74-33685 Boeing Computer Services, Inc., Seattle, Wash.
USE OF SMF DATA FOR PERFORMANCE ANALYSIS AND RESOURCE ACCOUNTING ON IBM LARGE SCALE COMPUTERS
R. E. Betz *In* NBS Computer Performance Evaluation Sep. 1974 p 23-32 refs (For availability see N74-33682 23-08)

Hardware and software techniques used in measuring the performance of computer systems are discussed. The SARA (Systems Analysis and Resource Accounting) system is discussed and its applications are defined. The operational concepts of SARA are explained. Typical SARA studies are analyzed. Results of computer evaluation tests are examined and the conclusions resulting from the tests are reported. Author

N74-33686 Army Management Systems Support Agency, Washington, D.C.
USING SMF AND TFLOW FOR PERFORMANCE ENHANCEMENT
J. M. Graves *In* NBS Computer Performance Evaluation Sep. 1974 p 33-36 (For availability see N74-33682 23-08)

The computer operations of the U.S. Army Management Systems Support Agency are described. The tools used to evaluate the computer systems are identified as: (1) hardware monitors (DYNAPROBE and XRAY) and (2) software monitor (CUE). The reports that are used to provide systems analysis are defined and their applications are explained. The benefits resulting from the use of the designated programs and reports are analyzed. Author

N74-33687 Army Computer System Command, Fort Belvoir, Va.
USACSC SOFTWARE COMPUTER SYSTEM PERFORMANCE MONITOR: SHERLOC
Philip Balcom and Gary Cranson *In* NBS Computer Performance Evaluation Sep. 1974 p 37-43 (For availability see N74-33682 23-08)

The internal and external characteristics of a software monitor system are described. The system is identified as SHERLOC (Something to Help Everyone Reduce Load on Computers). The SHERLOC system primarily displays: (1) the number of times each core image module is loaded, and (2) active and wait time by core address for the supervisor and each partition. Emphasis is placed on the concepts required for a knowledgeable system programmer to develop his own monitor. The results of using SHERLOC for computer systems analysis are reported. Flow charts and sample data tables are included. Author

N74-33688 Bell Telephone Labs., Inc., Piscataway, N.Y.
BENCHMARK EVALUATION OF OPERATING SYSTEM SOFTWARE: EXPERIMENTS ON IBM'S VS/2 SYSTEM
Bruce A. Ketchledge *In* NBS Computer Performance Evaluation Sep. 1974 p 45-48 (For availability see N74-33682 23-08)

The problem of evaluating a new and familiar operating system using benchmarking techniques is discussed. A methodology for conducting a general evaluation of such a system is presented and illustrated with a study of the IBM VS/2 systems. The phases of the evaluation project are listed with a rough percentage of the total evaluation effort each might be expected to require. Specific case studies are examined to show the operation of the evaluation. Author

N74-33689 Mitre Corp., Bedford, Mass.
REPORT ON FIPS TASK GROUP 13 WORKLOAD DEFINITION AND BENCHMARKING
David W. Lambert *In* NBS Computer Performance Evaluation Sep. 1974 p 49-53 (For availability see N74-33682 23-08)

Benchmark testing, or benchmarking, one of several methods for measuring the performance of computer systems, is the method used in the selection of computer systems and services by the Federal Government. However, present benchmarking techniques not only have a number of known technical deficiencies, but they also represent a significant expense to both the Federal Government and the computer manufacturers involved. Federal Information Processing Standards Task Group 13 has been

established to provide a forum and central information exchange on benchmark programs, data methodology, and problems. The program of work and preliminary findings of Task Group 13 are presented in this paper. The issue of application programs versus synthetic programs within the selection environment is discussed. Significant technical problem areas requiring continuing research and experimentation are identified. Author

N74-33690 Army Computer System Command, Fort Belvoir, Va.
PERFORMANCE MEASUREMENT AT USACSC
Richard Castle *In* NBS Computer Performance Evaluation Sep. 1974 p 55-62 (For availability see N74-33682 23-08)

The design, development, programming, installation, maintenance, and improvement of a U.S. Army multicommand automatic data processing information systems are discussed. The multicommand automatic data processing information systems satisfy the information requirements for as many as 41 identical data processing installations located world-wide. The systems include both management data systems and tactical data systems. Methods for conducting performance measurement to reduce system program run time, configuration performance measurement, and identification of hardware and software bottlenecks caused by program changes or added workload from newly fielded positions are analyzed. Author

N74-33691 Air Force Dept., Washington, D.C. Federal Computer Performance Evaluation and Simulation Center.
A COMPUTER DESIGN FOR MEASUREMENT: THE MONITOR REGISTER CONCEPT
Donald R. Deese *In* NBS Computer Performance Evaluation Sep. 1974 p 63-72 (For availability see N74-33682 23-08)

The application of the monitor register concept for evaluating computer system performance is discussed. The operational problems involving hardware monitors are identified. Implementation of the monitor register concept for the Trident submarine program is examined to show the following: (1) fire control system software performance, (2) performance measurement of the Trident basic processor, and (3) use of the data available at the monitor register. Author

N74-33692 Marine Corps, Washington, D.C.
THE USE OF SIMULATION IN THE SOLUTION OF HARDWARE ALLOCATION PROBLEMS
W. Andrew Hesser *In* NBS Computer Performance Evaluation Sep. 1974 p 73-79 (For availability see N74-33682 23-08)

The steps taken to provide redistribution of U.S. Marine Corps owned computer hardware to five major installations are discussed. All simulation models involved were created directly from hardware monitor data. The problem to be solved by the redistribution of the computer capabilities are identified. The organization and functions of the computer services at the various installations are explained. The steps taken following the evaluation and the specific recommendations for implementing the proposed changes are reported. Author

N74-33693 RAND Corp., Santa Monica, Calif.
HUMAN FACTORS IN COMPUTER PERFORMANCE ANALYSES
A. C. Shetler *In* NBS Computer Performance Evaluation Sep. 1974 p 81-84 refs (For availability see N74-33682 23-08)

The effects of human factors during experimental planning, test execution, and data analysis for computer performance evaluation are considered. A computer performance experiment using the normal system environment requires that an analyzer be aware if the human problems associated with testing hypotheses. The five considerations are identified as: (1) ensuring participant awareness, (2) defining the measures, (3) testing the objectivity, (4) validating the environment, and (5) using multiple criteria. Author

N74-33694 Performance Development Corp., Trenton, N.J.
DOLLAR EFFECTIVENESS EVALUATION OF COMPUTING SYSTEMS
Leo J. Cohen *In* NBS Computer Performance Evaluation Sep. 1974 p 85-97 ref (For availability see N74-33682 23-08)

The dimensions for performing a technical evaluation of a computer system are defined as: (1) CPU-seconds, (2) byte seconds, and CPU-minute. The development of a method for creating a dollar evaluation that is related to the configuration as a capacity and to the use of the capacity by loads in all equipment categories is discussed. The approach adopted is the development of the concept of dollar use of the various configuration equipments relative to the dollar capacity that these equipments make available. The use of dollars concept is obtained from observed measures of technical performance, and the method conjoins these various measures into a set of dollar related measures of overall performance. Author

N74-33695 Army Materiel Command, St. Louis, Mo.
COMPUTER SCHEDULING IN AN MVT ENVIRONMENT
Daniel A. Verbois *In* NBS Computer Performance Evaluation Sep. 1974 p 99-106 (For availability see N74-33682 23-08)

A computer program is described which helps to eliminate many of the problems associated with scheduling of the U.S. Army Material Command Commodity Command Standard System. The operation of the Automated Production Scheduler is explained. The reports which are generated by the Automated Production Scheduler are identified. The advantages and disadvantages of automatic scheduling are analyzed. A primary advantage of the automated scheduler is the capability to update the scheduling data base with actual history data. Author

N74-33696 Bell Telephone Labs., Inc., New Brunswick, N.J.
PERFORMANCE EVALUATION OF TIME SHARING SYSTEMS
T. W. Potter *In* NBS Computer Performance Evaluation Sep. 1974 p 107-114 (For availability see N74-33682 23-08)

Techniques for evaluating the performance of time sharing computing systems are described. Reasonable synthetic jobs are created that represent the user workload. The synthetic jobs are then used in benchmarks under experimental design to obtain response curves. The response curves aid in determining under which load conditions the time-sharing system will degrade beyond acceptance and the most cost-effective method of upgrading. This information combined with a reasonable growth study keeps the time-sharing system from severe performance degradation. Author

N74-33697 Naval Weapons Lab., Dahlgren, Va.
A CASE STUDY IN MONITORING THE CDC 6700: A MULTI-PROGRAMMING, MULTI-PROCESSING, MULTI-MODE SYSTEM
Dennis M. Conti *In* NBS Computer Performance Evaluation Sep. 1974 p 115-118 (For availability see N74-33682 23-08)

A case study of an effort to monitor the performance of the CDC 6700 computer is presented. The goals, approach, and future plans of the monitoring effort are outlined. The benefits accrued from the study are analyzed. Several software monitors are described, together with some proposed hardware monitoring configurations. Author

N74-33698 Air Force Dept., Washington, D.C. Federal Computer Performance Evaluation and Simulation Center.
FEDSIM STATUS REPORT
Michael F. Morris and Philip J. Kiviat *In* NBS Computer Performance Evaluation Sep. 1974 p 119-122 (For availability see N74-33682 23-08)

The organization and functions of a Federal computer performance evaluation and simulation center are discussed. The organization provides consultant services throughout the Federal Government to improve the performance of computer systems, both existing and proposed, on a fully cost-recoverable basis. Specific accomplishments of the organization are tabulated. Diagrams of the organization, agency relationships, resources, and procedures are provided. Author

N74-33699 Naval Postgraduate School, Monterey, Calif.
DATA ANALYSIS TECHNIQUES APPLIED TO PERFORMANCE MEASUREMENT DATA
G. P. Learmonth *In* NBS Computer Performance Evaluation Sep. 1974 p 123-126 refs (For availability see N74-33682 23-08)

A survey is presented of the pertinent topics of statistical analysis as they relate to computer system performance measurement and evaluation. Two approaches to computer

performance valuation are defined as: (1) the analytic modelling approach and (2) the empirical measurement and evaluation approach. The use of benchmarking as a controlled experiment technique is described. On-line measurement and simulation processes for computer evaluation are considered. Author

N74-33700 Naval Postgraduate School, Monterey, Calif.
A SIMULATION MODEL OF AN AUTODIN AUTOMATIC SWITCHING CENTER COMMUNICATIONS DATA PROCESSOR
Robert B. McManus *In* NBS Computer Performance Evaluation Sep. 1974 p 127-136 refs (For availability see N74-33682 23-08)

A network description is presented which focuses on the CDP in order to show the operation of the AUTODIN as a whole and how the CDP fits into the overall picture. The simulation program construction is described to include the more important restrictions involved. Conclusions concerning the AUTODIN as a result of the experiments conducted using the model are included. Author

N74-33701# RAND Corp., Santa Monica, Calif.
INTERNATIONAL HUMAN CHOICE AND COMPUTERS: CONFERENCE RETROSPECT AND PROSPECT
Enid Mumford (Manchester Univ.) and Harold Sackman Jun. 1974 37 p refs
(P-5258) Avail: NTIS HC $5.00

The views of trade unionists, computer technologists, and social scientists on computers and human decision making are presented. Issues related to management, trade unions, democracy, education, international, and social choices are discussed. Steps in decision making are presented, including (1) product identification, (2) formalization, (3) search for additional information, (4) modelling alternatives, and (5) choice. Recommendations are provided to improve the competence of information systems. J.A.M.

N74-33702# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE OPTIMIZATION OF A CLASS OF RECOGNITION ALGORITHMS
E. G. Kulianov [1974] 12 p refs Transl. into ENGLISH from Vychisl. Mat. i Mat. Fiz. (USSR), v. 14, no. 3, 1974 p 756-767
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

One of the classes of recognition algorithms, algorithms using the calculation of estimates, is examined. A search algorithm is constructed for the optimal algorithm of this class (optimization is carried out over the number of truly recognized rows of the checking matrix). Author

N74-33703*# Rockwell International Corp., Downey, Calif. Space Div.
SPACE SHUTTLE PROGRAM INFORMATION CONTROL AND RETRIEVAL SYSTEM FEASIBILITY STUDY REPORT
C. P. Lingle Nov. 1973 52 p
(Contract NAS9-14000)
(NASA-CR-140280; SD-73-SH-0067) Avail: NTIS HC $5.75 CSCL 09D

The feasibility of having a common information management network for space shuttle data, is studied. Identified are the information types required, sources and users of the information, and existing techniques for acquiring, storing and retrieving the data. The study concluded that a decentralized system is feasible, and described a recommended development plan for it. Author

N74-33704*# Martin Marietta Corp., Denver, Colo.
SCHEDULING LANGUAGE AND ALGORITHM DEVELOPMENT STUDY. VOLUME 1: STUDY SUMMARY AND OVERVIEW Final Report
Sep. 1974 42 p
(Contract NAS9-13616)
(NASA-CR-140281; MCR-74-314-Vol-1) Avail: NTIS HC $5.25 CSCL 09B

A high level computer programming language and a program library were developed to be used in writing programs for scheduling complex systems such as the space transportation system. The objectives and requirements of the study are summarized and unique features of the specified language and program library are described and related to the why of the objectives and requirements. Author

N74-33705*# Martin Marietta Corp., Denver, Colo.
SCHEDULING LANGUAGE AND ALGORITHM DEVELOPMENT STUDY. VOLUME 2: USE OF THE BASIC LANGUAGE AND MODULE LIBRARY Final Report
R. A. Chamberlain, D. E. Cornick, J. F. Flater, R. J. ODoherty, F. M. Peterson, H. R. Ramsey, and J. K. Willoughby Sep. 1974 193 p
(Contract NAS9-13616)
(NASA-CR-140282; MCR-74-314-Vol-2) Avail: NTIS HC $12.75 CSCL 09B

The capabilities of the specified scheduling language and the program module library are outlined. The summary is written with the potential user in mind and, therefore, provides maximum insight on how the capabilities will be helpful in writing scheduling programs. Simple examples and illustrations are provided to assist the potential user in applying the capabilities of his problem. Author

N74-33706*# Martin Marietta Corp., Denver, Colo.
SCHEDULING LANGUAGE AND ALGORITHM DEVELOPMENT STUDY. VOLUME 3: DETAILED FUNCTIONAL SPECIFICATIONS FOR THE LANGUAGE AND MODULE LIBRARY Final Report
R. A. Chamberlain, D. E. Cornick, J. F. Flater, R. J. Doherty, F. M. Peterson, H. R. Ramsey, and J. K. Willoughby Sep. 1974 398 p refs
(Contract NAS9-13616)
(NASA-CR-140283; MCR-74-314-Vol-3) Avail: NTIS HC $23.00 CSCL 09B

The detailed functional specifications presented are written as requirements for software implementation of the language and the program modules, and are aimed at a specific audience. Author

N74-33707# California Univ., Berkeley. Lawrence Berkeley Lab.
CONFERENCE PROGRAMS WITH INTERACTIVE GRAPHICS
D. M. Austin Mar. 1974 19 p refs Presented at the 2nd AEC Sci. Computer Inform. Exchange Meeting, New York, 2-3 May 1974
(Contract W-7405-eng-48)
(LBL-2675; Conf-740512-7) Avail: NTIS HC $4.00

Multi-user conference programs provide interaction between users at remote terminals through the mechanism of a time-sharing or multiprogrammed host computer system. Extension of the conference program concept to include terminals with graphic input and output capability will provide a more natural medium of interaction and information exchange for a large class of problems. The major problems to be solved in developing this type of network graphics facility are the interfacing to a variety of graphics terminals through a device-independent graphics system, providing reasonable data transmission rates necessary for interactive graphics, and the design of a suitable man-machine interface language to handle a variety of problem areas. Operating system requirements for both shared-program and shared-file conference systems are investigated, and the implementation of such a system based on the BKY 6000 operating system is explored. Author

N74-33708# California Univ., Livermore. Lawrence Livermore Lab.
EVALUATION OF SOME THIN WIRE COMPUTER PROGRAMS
A. J. Poggio, R. M. Bevensee, and E. K. Miller 1 Feb. 1974 10 p refs Presented at G-AP Intern. Symp., Atlanta, 10 Jun. 1974 Submitted for publication Sponsored by AEC
(UCRL-75428; Conf-740602-3) Avail: NTIS HC $4.00

An investigation was made of computer codes which are widely used to solve current and charge distribution problems of thin wire structures. Evaluations were made of computer code performance in solving such problems. Author

N74-33709# Union Carbide Corp., Oak Ridge, Tenn. Computer Sciences Div.
APPROXIMATE SIMULATION OF A VERY COMPLEX COMPUTER SYSTEM
R. D. Burris 1974 9 p refs Presented at Symp. on the Simulation of Computer Systems, Gaithersburg, Md., 4 Jun. 1974
(Contract W-7405-eng-26)
(CTC-INF-1068-Rev-1; Conf-740605-1) Avail: NTIS HC $4.00

An approximate model of a large computing system, including the subjects of data gathering, design, validation, and application was discussed. Depending upon the resource utilized, three work units were defined. They were the job, the job step, and the data set. Jobs use unit record devices, steps use CPU time, and data sets use channels, control units, and mass storage devices. The CPU time is allocated in one block per job step and I/O is allocated to each file of the job step in one block with the use time of each file defined as a function of device characteristics and numbers and size of records. Uses and projected uses for the model include modifying I/O device configurations, moving high-use data sets, modeling a PDP-10 computer, and adding one or two CPU's to the configuration. Author

N74-33710# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
NUMERICAL METHODS FOR CURVE AND SURFACE FITTING
J. G. Hayes Apr. 1974 38 p refs Presented at the IMA Conf. on Computational Problems in Statistics, Essex, Engl., Jul. 1973
(NPL-NAC-50) Avail: NTIS HC $5.00

A wide range of numerical methods is surveyed for the fitting of data by polynomials and splines. It covers both curves and surfaces, as well as the imposition of constraints on the fitting function and its derivatives. The methods are all based on the least-squares fitting criterion. Author (ESRO)

N74-33711# National Physical Lab., Teddington (England). Div. of Mechanical and Optical Metrology.
CALCULATION OF THE FLATNESS OF SURFACES: A LEAST-SQUARES APPROACH
K. G. Birch and M. G. Cox Dec. 1973 51 p refs
(NPL-MOM-5) Avail: NTIS HC $5.75

Details of computer programs, are presented with instructions to operate those programs, that will enable the departure from flatness of a surface to be calculated. The input data to the computer programs are measurements made along a series of generators on the surface by any one of a number of instruments that indicate relative height at points on the surface. The output from the computer can be in the form of a grid of surface heights denoting departures from flatness, the surface being arranged to be at a height and orientation that brings it into alignment with one of several reference surfaces. It is further possible to change the computer output to correspond to other reference surfaces, by means of a supplementary program, without repeating the complete calculation. The computer programs are written in ALGOL 60 for the KDF9 computer. Author (ESRO)

N74-33712# Genoa Univ. (Italy). Ist. di Elettrotecnica.
STUDY OF THE USE OF THE FAST FOURIER TRANSFORM IN SPECTRAL ANALYSIS; VOLUME 1: SUMMARY
F. Bertora, C. Braccini, G. Gambardella, and G. Musso [1973] 36 p 3 Vol.
(Contract ESOC-486/73-T)
(ESRO-CR(P)-467) Avail: NTIS HC $5.00

A summary of the investigations on the applications of the fast Fourier transform (FFT) to spectral analysis is presented, mainly by assessing the consequences of the FFT use from the point of view of accuracy and statistical significance of the analysis. The presently available techniques in spectral analysis are surveyed and classified according to their optimum field of application. Recommendations are made for the optimum choice of such parameters as record length, bandwidth, etc. Available spectral windows are surveyed and their use is assessed. The spectral analysis of nonstationary time series is discussed, as well as cross spectral analysis and multivariate spectral analysis. The application of frequency warping to vernier spectral analysis is investigated. Accuracy considerations and recommendations on the best FFT algorithm to be used are given. ESRO

N74-33713# Genoa Univ. (Italy). Ist. di Elettrotecnica.
STUDY ON THE USE OF THE FAST FOURIER TRANSFORM IN SPECTRAL ANALYSIS, VOLUME 2
F. Bertora, C. Braccini, G. Gambardella, and G. Musso [1973] 330 p refs 3 Vol.
(Contract ESOC-486/73-T)
(ESRO-CR(P)-468) Avail: NTIS HC $19.50

A study, dealing with the theory of spectral analysis and its implementation through the use of the fast Fourier transform (FFT) is presented. Emphasis was put on different techniques of performing univariate spectral analysis and on their physical meaning, rather than a rigorous and exhaustive mathematical theory of the subject. The FFT algorithm is discussed and different methods of spectral analysis and their performances from the points of view of bias of the variance and the computational efficiency of the estimates, are detailed. Some interesting cases of spectral estimation are presented, namely spectral analysis of non-stationary processes, multivariate and multidimensional analysis, and unequal resolution spectral analysis. A technique for unequal bandwidth spectral analysis, i.e. digital frequency warping is dealt with. ESRO

N74-33714# Genoa Univ. (Italy). Ist. di Elettrotecnica.
STUDY ON THE USE OF THE FAST FOURIER TRANSFORM IN SPECTRAL ANALYSIS, VOLUME 3
F. Bertora, C. Braccini, G. Gambardella, and G. Musso [1973] 121 p refs 3 Vol.
(Contract ESOC-486/73-T)
(ESRO-CR(P)-469) Avail: NTIS HC $9.25

A software package, consisting of a SPECAN program developed to perform spectral analysis according to the user's requirements, and other routines that can be used to perform single tasks in particular ways, is presented. This version of the program SPECAN is relatively simple and does not make use of advanced programming features. The whole package is written in a low-level FORTRAN language, except for a version of the subroutine FFTNS performing a particular FFT algorithm, that is written in the assembler language of the C2-10070 computer to maximize efficiency. ESRO

N74-33715# Royal Netherlands Meteorological Inst., De Bilt.
FAST FOURIER TRANSFORM [FAST FOURIER TRANSFORMATIE]
E. H. J. Vermaas 1974 59 p refs In DUTCH; ENGLISH summary
(KNMI-WR-74-1) Avail: NTIS HC $6.00

The fast Fourier transform (FFT), an efficient technique for evaluating the finite discrete Fourier transform (DFT) is dealt with. An explanation of the FFT algorithm is given, and two algorithms are presented for transforming real functions making use of the DFT. As examples of algorithms which make use of FFT procedures, two ALGOL-60 procedures are described to compute auto and cross spectra of stationary time series. ESRO

N74-33716# Wisconsin Univ., Madison. Dept. of Computer Sciences.
A HIERARCHICAL NET-STRUCTURE LEARNING SYSTEM FOR PATTERN DESCRIPTION
Harold Addison Williams, Jr. Jan. 1974 185 p refs
(Grants NSF GJ-36312; PHS-MH-12266)
(PB-231822/8; WIS-CS-199-74) Avail: NTIS HC $12.25 CSCL 09B

A computer program that recognizes and describes two-dimensional patterns, and the subpatterns composing them, as well as outputting names and the locations and sizes of both patterns and subpatterns is discussed. The program also recognizes all patterns in a scene consisting of several patterns. Patterns are stored in a hierarchical, net-structure permanent memory, which is completely learned as a result of simple feedback from a trainer. Weighted links between memory nodes represent subpattern/pattern relationships. A short term memory is used to store instances of permanent memory information during recognition. (Modified author abstract) GRA

N74-33717# Texas Univ., Austin. Electronics Research Center.
FINDING THE EDGES OF THE SURFACES OF THREE-DIMENSIONAL CURVED OBJECTS BY COMPUTER
J. W. McKee and J. K. Aggarwal 15 Mar. 1974 78 p refs
(Contract F44620-70-C-0091; Grant NSF GK-42790)
(PB-231922/6; TR-156) Avail: NTIS HC $4.00 CSCL 09B

The paper presents an algorithm for finding the edges of surfaces of simple curved or planar three-dimensional objects. The object is viewed by an image dissector camera controlled by a computer. The algorithm is divided into four steps -- edge marking, edge refining, edge tracing, and edge completion. Each step is described in detail and examples are given illustrating each step. The output of the algorithm is a two-dimensional array in which the edges are marked. The performance of the algorithm on scenes composed of simple objects like coffee cups, a hammer, a coke bottle, or a block is presented and compared to the performance of other methods. (Modified author abstract) GRA

N74-33718# Wisconsin Univ., Madison. Dept. of Computer Sciences.
NONLINEAR PROGRAMMING THEORY AND COMPUTATION
O. L. Managasarian Jul. 1973 42 p refs
(Grant NSF GJ-35292)
(PB-231814/5; WIS-CS-185-73) Avail: NTIS HC $3.25 CSCL 12B

A survey of nonlinear programming theory and computational algorithms is given. Subjects covered are: optimality conditions, duality theory, unconstrained and constrained optimization algorithms. Author (GRA)

N74-33719# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
AN INTERACTIVE POLYNOMIAL MANIPULATION PROGRAM Final Report
Henry J. McGlynn, Jr. Jan. 1974 50 p refs
(AD-780527; ASD-TR-74-1) Avail: NTIS CSCL 09/2

The report serves as a user's guide for a teletype-interactive polynomial manipulation program called POLOPS (for polynomial operations). The program was primarily developed as a tool to assist the control system analyst in the manipulation of transfer function polynomials. The program, however, is of a general nature and is not restricted to control system applications. The program was designed for use on the CDC 6600 INTERCOM system at Wright-Patterson Air Force Base. However, American Standards Association FORTRAN and the more restrictive alphanumeric word lengths of the IBM 360 have been used. A complete program listing is presented in Appendix 3. GRA

N74-33720# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
ADAPTIVE ROUTING ALGORITHMS FOR DISTRIBUTED COMPUTER NETWORKS Ph.D. Thesis - Harvard Univ.
John M. McQuillan May 1974 492 p refs
(Contracts DAHC15-69-C-0179; F08606-73-C-0027)
(AD-781467; BBN-2831) Avail: NTIS CSCL 09/2

The report discusses two primary objectives: first, to provide a broad introduction to the subject of system design for computer networks, including the specification of the communications algorithms, and, second, to present a deeper discussion of routing algorithms for such networks. GRA

N74-33721# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
THE INTERFACE MESSAGE PROCESSOR PROGRAM
Jun. 1974 123 p refs
(Contracts DAHC15-69-C-0179; F08606-73-C-0027)
(AD-781466; BBN-Tech-Inform-89) Avail: NTIS CSCL 09/2

The ARPA Network has been in operation for over four years and has become an international facility. Provision has been made for terminal access to the network from sites which do not enjoy the ownership of an independent computer system. Implementation of the IMPs required the development of a sophisticated computer program. This program has been previously described. As stated then, the principal function of the IMP program is the processing of packets, including the following: segmentation of Host messages into packets; receiving, routing, and transmitting store-and-forward packets; retransmitting unacknowledged packets; reassembling packets into messages for transmission into a Host; and generating RFNMs and other control messages. The program also monitors network status, gathers statistics, and performs on-line testing. GRA

N74-33722# Science Applications, Inc., La Jolla, Calif.
MAZE 3: A SEQUENTIAL COMPUTER SPECTRAL ENHANCEMENT CODE: STUDIED FOR CONVERSION TO ILLIAC 4 Final Report, 1 Nov. 1972 - 31 Jan. 1974
Louis Huszar, John H. Reed, and Martin Sperling Dec. 1973 74 p refs
(Contract DNA001-73-C-0026; ARPA Order 2247)
(AD-781280; SAI-73-649-LJ; DNA-3274F) Avail: NTIS CSCL 20/8

A mathematical model is described which forms the basis of a spectral enhancement program that follows along the lines of the MAZE series of spectral unfolding codes. The treatment of a priori and a posteriori information functions are elaborated as well as their optimization and subsequent implementation. The code was developed for a serial computer and the results are demonstrated for several examples. The code has also been converted to the Illiac 4 parallel processor computer system in the GLYPNIR language. Author (GRA)

N74-33723# RAND Corp., Santa Monica, Calif.
COMPUTER PERFORMANCE ANALYSIS: CONTROLLED TESTING
A. C. Shelter and T. F. Bell Apr. 1974 89 p refs
(Contract DCA100-73-C-0022)
(AD-781277; R-1436-DCA) Avail: NTIS CSCL 09/2

Controlled testing is a process for selectively limiting the activities of a computer system to discover and varify the execution characteristics of that system. The report discusses the procedures for accomplishing that task. GRA

N74-33724# National Academy of Engineering, Washington, D.C. Navy Environmental Protection Program Study Group.
STUDY OF THE NAVY ENVIRONMENTAL PROTECTION DATA BASE Final Report
Mar. 1974 162 p refs
(Contract N62399-74-C-0001)
(AD-781322; NAE-NEPP-74-6) Avail: NTIS CSCL 05/2

The study assesses the likelihood that the recently initiated Navy Environmental Protection Data Base (NEPDB) will fulfill its objectives as the single centralized Navy service to meet environmental data requirements. The report recognizes the special character of Navy activities, organization, and environmental problems. Because of the recent initiation of the Data Base system, only wastewater emission and air quality data acquisition programs approach being in fully operational status as of September 1973. Procedures and programs for data acquisition regarding control of noise, solid waste management, and land use are in various stages of development. GRA

N74-33725# Maryland Univ., College Park. Computer Science Center.
EXTENDED CONTROLLED TABLE RADIAL L SYSTEMS
Gift Siromoney and Rani Siromoney Jun. 1974 21 p refs
(Contract N00014-67-A-0239-0012)
(AD-781279; TR-309) Avail: NTIS CSCL 09/2

Two systems of models to generate two-dimensional circular patterns are proposed. The first system consists of models which represent growth along the radii, the number of rays being unlimited. Comparison is made with cycle languages and our earlier rectangular model. Catenation and star operation for string languages are extended to radial and transversal catenation, and star operations and closure properties examined. The second system includes developmental models which reflect radial and transversal growth. Radial and transversal generations take place in parallel, controlled by a control set, and describe circular developmental patterns. GRA

N74-33726# Naval Research Lab., Washington, D.C.
AN EDITING ROUTINE FOR FORTRAN PROGRAMS Final Report
Robert R. Dasenbrock May 1974 51 p
(NRL Proj. B01-10; RR0140241)
(AD-779841; NRL-MR-2805; NRL-Computer-Bull-38) Avail:

NTIS CSCL 09/2

A FORTRAN program has been written that allows CDC-3800 users to perform character string substitutions in FORTRAN programs. Other capabilities include several conditional editing commands and the replacement, insertion, and deletion of specified statements. Author (GRA)

N74-33727# Cornell Univ., Ithaca, N.Y. Dept. of Computer Science.

ON THE POWER OF MULTIPLICATION IN RANDOM ACCESS MACHINES

Janos Simon Apr. 1974 40 p refs

(PB-232391/3; CU-CSD-74-205) Avail: NTIS HC $3.25 CSCL 09B

The author considers random access machines with a multiplication operation, having the added capability of computing logical operations on bit vectors in parallel. The contents of a register are considered both as an integer and as a vector of bits and both arithmetic and Boolean operations may be used on the same register. It is proved that, counting one operation as a unit of time and considering the machines as acceptors, deterministic and nondeterministic polynomial time acceptable languages are the same, and are exactly the languages recognizable in polynomial tape by a Turing machine. It is observed that the same measure on machines without multiplication as polynomially related to Turing machine time - thus the power of multiplication on this model characterizes the difference between Turing machine. GRA

N74-33728# Texas Univ., Austin. Electronic Research Center.

VISUAL LEARNING FROM MULTIPLE VIEWS

Stephen A. Underwood and Clarence L. Coates 6 May 1974 41 p refs

(Grant NSF GK-42790)

(PB-232361/6; TR-158) Avail: NTIS HC $3.25 CSCL 09B

An algorithm is presented in which a computer is visually shown a sequence of views of a solid planar object as the object is rotated in space. The computer automatically forms a three-dimensional description of the object. The description consists of a deterministic description of the object's surfaces and how they are interconnected to form the object, along with a measure of each surface's shape which is invariant to 3-dimensional rotation. From this self-learned model of the object, the object can be later recognized from any viewing angle. This is accomplished by generating two sets of mappings of one object description to another object description. Author (GRA)

N74-33729# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.

ERROR ESTIMATION AND ITS APPLICATION TO FEATURE EXTRACTION IN PATTERN RECOGNITION

T. Lissack and K. S. Fu Aug. 1973 162 p refs

(Grant NSF GK-36721)

(PB-232412/7; TR-EE73-25) Avail: NTIS HC $5.00 CSCL 09B

A family of separability measures for pattern classification is proposed. The relations between the error bounds and the separability measures are derived. Direct estimation of the error using a proposed separability measure is investigated for both parametric and nonparametric cases. The error estimation scheme is also used for feature extraction and ordering. A forward sequential recognition procedure for the multiclass problem with dependent features is studied. The optimal procedure that minimizes the average cost of features and meets a prespecified error is presented. A suboptimal procedure for the general N-step dynamic sequential recognition procedure is proposed. GRA

N74-33730# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.

SOME PROPERTIES OF WEB GRAMMARS

J. M. Brayer and K. S. Fu Apr. 1974 51 p refs

(Grant NSF GK-36721)

(PB-232411/9; TR-EE74-19) Avail: NTIS HC $3.75 CSCL 09B

The simplest forms of web grammars are studied with a view toward application to picture pattern recognition. Regular-linear and regular web grammars are defined and proved equivalent to regular string and regular tree grammars respectively. Set down anywhere web automata for these languages are studied. Several properties of context free web grammars are developed. Context free web grammars can be completely reduced. The uvwxy theorem holds for context free web grammars. The two basic normal forms, Chomsky and Greibach, do not exist for context free web grammars. Context sensitive web grammars are equivalent to monotonic web grammars. GRA

N74-33731# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.

A DECISION FUNCTION METHOD FOR BOUNDARY DETECTION

Y. P. Chien and K. S. Fu Oct. 1973 32 p refs

(Grant NSF GK-36721)

(PB-232413/5; TR-EE73-34) Avail: NTIS HC $3.25 CSCL 09B

A computer algorithm for boundary detection is presented. A criterion function is set based on the specific applications on hand to evaluate the performance or cost of detecting the boundary at the local and global levels. Then the set of boundary points is selected as the ones which minimize this criterion function. This algorithm was tested to locate the heart boundary of the PA chest X-ray pictures. It is found that this algorithm will successfully extract the heart boundary even under very noisy backgrounds. GRA

N74-33732# Stanford Univ., Calif. Dept. of Electrical Engineering and Computer Science.

PERFORMING THE PERFECT SHUFFLE IN AN ARRAY COMPUTER

Tomas Lang Oct. 1973 19 p refs

(Grant NSF GJ-1180)

(PB-232624/7; SU-STAN-CS-74-427; TN-36) Avail: NTIS HC $4.00 CSCL 09B

The perfect shuffle is an important permutation in parallel processing applications. An algorithm is presented for the realization of this permutation on a vector of N=(2 sup n) data points in an array computer with m=(2 sup k) (k<n) memory modules. The interconnection required between modules is a shuffle and a shuffle-exchange network. The algorithm is efficient in the sense that no conflicts occur in the accessing of elements from memory. As an application of the use of this algorithm, the computation of the FFT is considered. In this case, the computation is done as part of the permutation, resulting in an efficient overall procedure. The result of the FFT algorithm is in bit reversed order, to complete the application, an efficient algorithm for the unscrambling in place is also presented. GRA

N74-33733# Stanford Univ., Calif. Dept. of Electrical Engineering and Computer Science.

EFFICIENT DATA ROUTING SCHEMES FOR ILLIAC 4-TYPE COMPUTERS

Samuel E. Orcutt Apr. 1974 37 p refs

(Grant NSF GJ-41093)

(PB-232623/9; SU-STAN-CS-74-429; TR-70) Avail: NTIS HC $5.00 CSCL 09B

Much research was recently done on processor interconnection schemes for parallel computers. These interconnection schemes allow certain permutations to be performed in less than linear time, typically O(log N) or O(square root of N) for a vector of N elements and N processors. It is shown that many permutations can also be performed in less than linear time on a machine with an ILLIAC 4-type interconnection scheme. These results show that recently developed interconnection schemes yield less speedup over the ILLIAC 4-type interconnections that was thought. These results are of current interest due to the present ILLIAC 4 programming effort. GRA

N74-33734# Maryland Univ., College Park. Dept. of Electrical Engineering.

HIGH DENSITY MEMORY Final Report, Apr. 1972 - Dec. 1973

H. C. Lin and A. S. Chawla 1973 69 p

(Contract N00014-67-A-0239-0022)

(AD-781919) Avail: NTIS CSCL 09/2

A study was made of programmable non-volatile metal nitride

oxide silicon (MNOS) memory. The work included: setting up of MNOS processing; evaluation and characterization of MNOS devices; design of memory integrated circuits; and, fabrication of memory integrated circuits. GRA

N74-33735*# Stanford Univ., Calif. Digital Systems Lab.
DYNAMIC MEMORIES WITH FAST RANDOM AND SEQUENTIAL ACCESS
Harold S. Stone May 1974 35 p refs Sponsored by NASA (Grant NSF GJ-41093)
(NASA-CR-140033; PB-232861/5; TN-84) Avail: NTIS HC $4.75 CSCL 09B

Two dynamic memories are considered. The first memory has the property that every item is accessible in O(log to the base 2 of N) steps, and that after access to the first two items of a block of contiguous items, each successive item can be accessed in unit time. A new derivation of the properties is given and minor variations and improvements of the memory access algorithm are indicated. The second memory as proposed originally has the random access property but not the sequential access property. It is shown that for certain sizes of memories, an address recording exists that exhibits the sequential access property. Thus the second memory scheme is a possible alternative to the first when both random and sequential access are useful in a dynamic memory. GRA

N74-33736# Stanford Univ., Calif. Dept. of Electrical Engineering and Computer Science.
INTERCONNECTIONS BETWEEN PROCESSORS AND MEMORY MODULES USING THE SHUFFLE-EXCHANGE NETWORKS
Tomas Lang Oct. 1973 31 p refs
(Grant NSF GJ-1180)
(PB-232633/8; SU-STAN-CS-74-428; TR-76) Avail: NTIS HC $4.75 CSCL 09B

The shuffle-exchange network is considered as an interconnection network between processors and memory modules in an array computer. Lawrie showed that this network can be used to perform some important permutations in (log of N to the base 2) steps. This work is extended and a network is proposed that permits the realization of any permutation in O(square root of N) shuffle-exchange steps. Additional modifications to the basic procedure are presented that can be applied to perform efficiently some permutations that were not realizable with the original mechanism. GRA

N74-33850 Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
EFFECTS OF HYSTERESIS AND OF INTERNAL TRANSFORMATION OF INCHES INTO METERS FOR THE ARISTOGRID DIGITIZER [EINFLUESSE DER HYSTERESE UND DER INTERNEN UMWANDLUNG VON ZOLL IN METER BEIM ARISTOGRID-DIGITIZER]
Theodor Johannsen *In its* Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 41-49 refs In GERMAN; ENGLISH summary (For availability see N74-33846 23-13)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N74-33737*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE MANUFACTURE OF FLAT CONDUCTOR CABLE
W. Angele May 1974 87 p refs Prepared in cooperation with Hayes Intern. Corp.
(Contract NAS8-21809)
(NASA-TM-X-64875) Avail: NTIS HC $4.00 CSCL 09A

The major techniques are described for fabricating flat conductor cable (FCC). Various types of FCC, including unshielded, shielded, power, and signal, in both existing and conceptual constructions, are covered. Author

N74-33738*# National Aeronautics and Space Administration. Pasadena Office, Calif.
IMPROVED STRUCTURE AND METHOD OF PRODUCING COMPOSITE OF GAPPED AND UNGAPPED CORES Patent Application
William T. McLyman, inventor (to NASA) (JPL) Filed 13 Sep. 1974 18 p Sponsored by NASA
(NASA-Case-NPO-13413-1; US-Patent-Appl-SN-505880) Avail: NTIS HC $4.00 CSCL 09A

A composite toroidal core having high permeability for small magnetizing current and low permeability for much higher magnetizing current is fabricated by winding two toroidal cores, one to fit inside the other, using a metal ribbon. The outer core is cut through at least one side, and reset with less than a 1 mil gap, after lapping and etching the cut ends, using a sheet of nonmagnetic material to space the gap and a strap around the outer core to hold the cut ends together with the sheet inbetween. Ribbon is then unwound from around the inner core until the inner core just fits inside the outer core. NASA

N74-33739*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF MANUFACTURING COMPOSITE SUPERCONDUCTORS Patent Application
Willard D. Coles, inventor (to NASA) Filed 30 Sep. 1974 10 p
(NASA-Case-LEW-11582-1; US-Patent-Appl-SN-510678) Avail: NTIS HC $4.00 CSCL 09A

Problems of magnetization and self-field instability in composite electrical superconductors are reduced or eliminated by an improved method for transposition of the filaments within the conductor. The method includes, as a first step, forming a composite strand by embedding superconductive filaments within a non-superconductive matrix. Filaments are arranged substantially parallel to the longitudinal axis of the conductor and form a linear, closed geometrical figure, such as a circle or square, in cross section. A twist is then imparted to the strand to transpose the filaments around the axis of the strand in a substantially helical path. A plurality of strands so produced are combined within an elongate non-superconductive matrix and arranged so that the strands are substantially parallel to the longitudinal axis of the matrix and form a linear closed figure. A twist is then imparted to the conductor so that each filament within the conductor is thus transposed along the axis of the conductor, and follows a modified helical path. NASA

N74-33740*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROCESS FOR FABRICATING SiC SEMICONDUCTOR DEVICES Patent Application
J. Anthony Powell and Herbert A. Will, inventors (to NASA) Filed 24 Sep. 1974 15 p
(NASA-Case-LEW-12094-1; US-Patent-Appl-SN-508784) Avail: NTIS HC $4.00 CSCL 09A

Sections are cut from a SiC platelet such that the sections have a-faces parallel to the c-axis of the SiC platelet. The sections serve as substrates for the growth of SiC layers by attaching the substrates to a body which is then placed in a chamber and the chamber evacuated. Hydrogen is then admitted, and the body on which the substrates are mounted is heated to produce a temperature profile such that the subsequent admission of a carbon containing chlorosilane gas or a mixture of a chlorosilane gas and a hydrocarbon gas will cause free silicon to be deposited at one end of the body while SiC crystals grow on the substrates which are in a preferred temperature range. Dopant gases, either p-type or n-type, can be admitted with the chlorosilane or hydrocarbon gas to produce the desired type of semiconductor. NASA

N74-33741*# Harris Corp., Melbourne, Fla.
DEPLOYABLE REFLECTOR DESIGN FOR Ku-BAND OPERATION
B. C. Tankersley Sep. 1974 391 p refs
(Contract NAS1-11444)
(NASA-CR-132526) Avail: NTIS HC $22.75 CSCL 09C

A project was conducted to extend the deployable antenna technology state-of-the art through the design, analysis, construction, and testing of a lightweight, high surface tolerance, 12.5 foot

diameter reflector for Ku-band operation. The applicability of the reflector design to the Tracking and Data Relay Satellite (TDRS) program was one requirement to be met. A documentary of the total program is presented. The performance requirements used to guide and constrain the design are discussed. The radio frequency, structural/dynamic, and thermal performance results are reported. Appendices are used to provide test data and detailed fabrication drawings of the reflector. Author

N74-33742*# R. F. Communications, Inc., Rochester, N.Y. Government Products Div.
DESIGN EVALUATION: S-BAND EXCITERS Final Report
31 May 1974 225 p
(Contract NAS5-20464)
(NASA-CR-139044) Avail: NTIS HC $14.25 CSCL 09C

A design evaluation study was conducted to produce S-band exciter (SBE) system to provide a highly stable phase or modulated carrier for transmission to spacecraft. The exciter is part of an S-band receiver/exciter/ranging system at Spaceflight Tracking and Data Network (STDN) ground stations. The major features of the system are defined. Circuit diagrams of the electronic components are provided. Author

N74-33743# Centre National d'Etudes des Telecommunications, Lannion (France).
EVALUATION PROGRAMME FOR THE SPACE APPLICATION OF GUNN EFFECT AND AVALANCHE DIODES, PHASE 1 Final Report
C. Guenais and J. Y. Boulaire 1973 124 p refs
(Contract ESTEC-1970/73-MD)
(ESRO-CR(P)-432) Avail: NTIS HC $9.25

The evaluation of silicon avalanche diodes and gallium arsenide Gunn diodes for space utlization is presented. Topics detailed include diode structure, base materials, structure production, metallizing, chip cutting encapsulating, metal to metal thermocompression welding connections, optimization of chip diameter, sealing, electric performance tests, electric behavior of the diodes, and future trends for reliability improvement. A report on the state of the art and production method is included together with comments on diode fault physics. For individual titles, see N74-33744 through N74-33747.

N74-33744 Laboratoire Central de Recherches Thomson-CSF, Orsay (France). Dept. Microelectrique Hyperfrequence.
TECHNOLOGY OF SILICON AVALANCHE DIODES AND GALLIUM ARSENIDE GUNN DIODES
J. V. Bouvet *In* Centre Natl. d'Etudes des Telecommun. Evaluation Programme for the Space Appl. of Gunn Effect and Avalanche Diodes 1973 59 p (For availability see N74-33743 23-09)

The Si avalanche diodes are of two main types for the 6 to 40 GHz band: pnn, or single drift structure for the low frequency part 6 to 20 GHz. These diodes are used mainly as oscillators. The GaAs Gunn diodes cover the frequency band from 5 to 18 GHz. They also work as oscillators. The structure is NM(+)N(++), with N(++) as substrate. Characteristics of the active layer, i.e. doping and thickness, depend on the desired frequency. ESRO

N74-33745 Radiotechnique (LEP), Limeil-Brevannes (France).
TECHNOLOGY OF GUNN DIODES
M. Michel *In* Centre Natl. d'Etudes de Telecommun. Evaluation Programme for the Space Appl. of Gunn Effect and Avalanche Diodes 1973 16 p (For availability see N74-33743 23-09)

The fabrication of GaAs transferred electron Gunn diodes is described. The structure of the device depends on its application in the X band as: high and medium power oscillator, making use of inverted mounting technology; lower power oscillators, with upside mounting technology; high and medium power oscillators, using inverted mounting technology with beam lead connections; and transferred electron amplifiers, using inverted mounting technology and beam lead connections. An analysis is presented of reliability investigations. ESRO

N74-33746 Radiotechnique (LEP), Limeil-Brevannes (France).
GaAs AVALANCHE DIODES
B. Kramer *In* Centre Natl. d'Etudes de Telecommun. Evaluation Programme for the Space Appl. of Gunn Effect and Avalanche Diodes 1973 16 p refs (For availability see N74-33743 23-09)

The fabrication of GaAs avalanche diodes with a Schottky barrier is described. The diode structure is that of an inverted mesa to achieve a good thermal dissipation, the junction being located as close as possible to the heat sink. A forward biased Schottky barrier was chosen as upper contact to make the fabrication simpler and to improve reproducibility. The starting material was a GaAs substrate on which a highly doped buffer layer was grown by vapor phase epitaxy. A failure analysis of these diodes is presented. ESRO

N74-33747 Plessey Co., Ltd., Towcester (England).
GUNN DIODES
F. A. Myers *In* Centre Natl. d'Etudes de Telecommun. Evaluation Programme for the Space Appl. of Gunn Effect and Avalanche Diodes 1973 5 p (For availability see N74-33743 23-09)

Gallium arsenide Gunn diode technology is reviewed. The so-called integral heat sink process was applied to Gunn structures. In this technique, a gold layer is evaporated onto the GaAs layer and electroplated to form a large heat sink. Devices are mesa etched leaving small islands of GaAs on a large gold pad, after which this is cut through and bonded into conventional packages. ESRO

N74-33748# Sandia Labs., Albuquerque, N.Mex.
ELECTRICAL CONTACT ARCING OBSERVED AT VOLTAGES BELOW THE IONIZATION POTENTIAL
R. E. Cuthrell Mar. 1974 28 p refs
(Contract AT(29-1)-789)
(SLA-74-94) Avail: NTIS HC $4.50

Results of low-voltage electrical contact arcing experiments are presented. Visible arcs were detected at potentials down to, but not below, the melting potentials for various metals (0.3 to 1.1 volts), whereas the minimum voltage for arcing has been previously assumed to be 11 to 15 volts. Scanning electron microscope photomicrographs show arc pits, melting, and spattering for contacts arced at these low voltages. Circuits were designed to minimize the inductance, and oscilloscope traces of the arcing potentials were obtained. Author (NSA)

N74-33749# Commissariat a l'Energie Atomique, Grenoble (France).
LOW LEVEL MOS TRANSISTOR AMPLIFIERS USING STORAGE TECHNIQUES
R. Poujois 3 Sep. 1973 23 p refs In FRENCH Presented at the Conf. on Develop. of Integrated Circuits and Hybrid Circuits, Paris, 30 Mar. 1973
(CEA-Conf-2560; Conf-730358-1) Avail. AEC Depository Libraries HC $4.25

The conference on the low level, high performance, fully integrated, analog amplifier for storing compensating for offset voltages is presented. Miminum time for storage in memory capacitances in MOST amplifiers are reported and it is concluded that the amplifier can be used in a great variety of applications. M.C.F.

N74-33750# California Univ., Livermore. Lawrence Livermore Lab.
EMP-ENDUCED SKIN CURRENTS ON AIRCRAFT
J. A. Landt and E. K. Miller 1 Feb. 1974 11 p refs Presented at G-AP Intern. Symp., Atlanta, 10 Jun. 1974 Submitted for publication Sponsored by AEC
(UCRL-75426; Conf-740602-1) Avail: NTIS HC $4.00

The theory and numerical approach to determine the electric current flowing on the outer skin of an aircraft when illuminated by EMP is reported. The numerical solution of a thin wire, time dependent, integral equation is presented with subsequent predictions for the bulk axial skin currents on several aircraft excited by an EMP wave. M.C.F.

N74-33751# Bendix Corp., Kansas City, Mo.
CIRCUITRY FOR A HUMIDITY-LEVEL DETECTOR
J. W. Hill Feb. 1974 20 p refs
(Contract AT(29-1)-613)
(BDX-613-1019) Avail: NTIS HC $4.00

A prototype humidity-level detector is presented utilizing a lithium chloride humidity sensor. A dry-to-wet humidity-level indication is obtained through the deactivation of a calendar

watch as the humidity reaches a preset limit. Technical considerations in the design and utilization of the electronic circuitry are given. Measured accuracy and drift characteristics of the prototype are provided together with recommendations for improving these characteristics. NSA

N74-33752# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
CALCULATION OF VARIOUS-ORDER SENSITIVITIES IN LINEAR AND NONLINEAR NETWORKS
Martti Valtonen 1974 21 p refs
(S-65; ISBN-951-750-232-X) Avail: NTIS HC $4.25

A simple method is presented for the calculation of various order sensitivities in linear and nonlinear networks. The method applies for frequency as well as time domain calculations. The sensitivities are obtained with the aid of external current sources without any network modifications. In the frequency domain (and DC) case, one admittance matrix inversion only is needed. The basic circuit analysis method may be numerical or semisymbolic with respect to s. The sensitivities will be in semisymbolic forms for the latter case. An application to Monte-Carlo and large-change multiparameter sensitivity analyses is discussed. Author (ESRO)

N74-33753# Centre Naticnal de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
CHARACTERIZATION OF TECHNOLOGICAL PROCESSES FOR MANUFACTURE OF HIGH VOLTAGE INTEGRATED CIRCUITS Final Report [CARACTERISATION DES DIFFERENTES OPERATIONS D'UN PROCESSUS TECHNOLOGIQUE EN VUE DE L'OBTENTION DE CIRCUITS INTEGRES HAUTE TENSION]
H. Martinot, B. Andre, J. Cabot, D. BielleDaspet, J. Pinel, L. Castaner, E. Ellouz, J. Martinez, A. Roizes, and R. Schuttler Mar. 1974 108 p refs In FRENCH Prepared jointly with Centre d'Etude Spatiale des Rayonnements and ONERA
(Contract DGRST-72-7-0532)
(LAAS-Publ-1107) Avail: NTIS HC $8.50

The various technological stages in view of realizing high voltage integrated circuits were analyzed. The electrical properties of bipolar NPN and PNP high voltage transistors developed by planar and multiepitaxial technologies were identified. The lifetime of silicon substrate material, diffused layers, and epitaxial layers was determined by the photoconductivity method or by transient photocurrent resulting from laser flashes. The effect of impurities was investigated by variations of the Hall constant as a function of temperature. ESRO

N74-33754# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
ANALYTICAL SMALL SIGNAL THEORY OF BARITT DIODES
T. G. VanDeRoer May 1974 41 p refs
(TH-74-E-46; ISBN-90-6144-046-7) Avail: NTIS HC $5.25

An analytical theory for the small-signal impedance and noise of Bariff (or punch-through) diodes is presented. The diode is divided into three regions. In the two regions closest to the injecting contact the effects of thermionic injection and diffusion are accounted for in an approximate way. In the remaining region diffusion is neglected but an otherwise exact solution is given for an arbitrary relationship between drift velocity and electric field. Results of the calculations are presented in graphical form and the influence of the parameters frequency, dc current, temperature and impurity concentration is discussed.
Author (ESRO)

N74-33755# Princeton Univ., N.J. Solid State and Materials Lab.
LOW TEMPERATURE IRRADIATION EFFECTS IN SiO2 INSULATED MIS DEVICES
E. Harari, S. Wang, and B. S. H. Royce 15 May 1974 28 p refs
(Contract N00014-67-Z-0151-0034; DNA Proj. NWER-TD-033)
(AD-781331; PSSL-150574; AMS-1169) Avail: NTIS CSCL 09/1

The storage of positive charge in the SiO2 insulator of MIS devices has been studied at both 300 and 80K. It was found that the additional charge stored in the oxide as a result of low temperature X-irradiation behaves quite differently from that induced by room temperature irradiation. This additional charge may be removed from the oxide by photodepopulation techniques, by field emission and by thermal annealing. The charge associated with traps stable at room temperature is shown to be insensitive to these treatments under the same experimental conditions. The experimental data indicate that the observed behavior is not due to positive ion transport within the oxide and strongly indicates that hole transport is occurring. Models for the trapping sites and the role of surface states are discussed. Author (GRA)

N74-33756# Harry Diamond Labs., Washington, D.C.
RADIATION SUSCEPTIBILITY OF HIGH POWER (GREATER THAN 200 mW) SPONTANEOUS INFRARED EMITTERS
Roland A. Polimadei, Stewart Share, Arnold S. Epstein, and Gene E. Gowins Feb. 1974 23 p refs
(AD-781306; HDL-TR-1650) Avail: NTIS CSCL 09/1

The effects of neutron and gamma irradiation on high-power (=200 mW) GaAs dome infrared emitters are reported. The threshold radiation levels for degradation of radiated power output, power efficiency, and external quantum efficiency are observed for neutron fluences of 1 x 10 to the 12th power n/sq cm (E = 10 keV) and for total gamma doses of 1 million rads (Si). These parameters decrease by three orders of magnitude at 2.2 x 10 to the 14th power n/sq cm for the neutron-irradiated device, and at 10 to the 8th power rads (Si) for the gamma-irradiated device. The reduction in power efficiency and external quantum efficiency with irradiation can be explained by the reduction in total minority carrier lifetime. The effect of radiation on the dome is negligible. The results of intensity-voltage and current-voltage measurements confirm that, even under the effects of nuclear irradiation, light is emitted in the diffusion region of the junction and that the charge flow is a diffusion process.
Author (GRA)

N74-33757# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
VARIABLE PULSE WIDTH MODULATOR EXPLORATORY DEVELOPMENT MODEL Triannual Technical Report, 1 Nov. 1973 - 31 Mar. 1974
Duane R. Torgerson Jun. 1974 56 p refs
(Contract DAAB07-73-C-0267; DA Proj. 1S6-62705-A-055)
(AD-781571; FR-72-14-435; ECOM-0267-2-73) Avail: NTIS CSCL 09/5

The report provides test results on the safe operating characteristics of the Complementary Pair Switch Element (CPSE) NPN transistor element. Test results of series CPSE operation is reviewed with switching currents of 30 amperes at 200 volts.
Author (GRA)

N74-33758# Army Hospital, Fort Jackson, S.C.
RESEARCH IN THE PROPERTIES OF THIN FILM THERMAL COMPONENTS
I. K. Andronik 26 Apr. 1974 9 p refs Transl. into ENGLISH from the book "Nizkotemperaturnye Termoelectricheskie Materialy Kisninev" USSR, 1970 p 148-154
(AD-781243; FSTC-HT-23-2246-72) Avail: NTIS CSCL 09/5

In microminiaturized electronic circuits, one of the most important problems is getting rid of heat which considerably limits the density of the circuitry. Thus the necessity of thermal control and the problem of finding a thermal control component appropriate for the object being cooled. The problem can be solved by using a film of thermal elements consisting of branches of very thin film with the largest possible temperature fall from the cold to the hot juncture. GRA

N74-33759# Army Foreign Science and Technology Center, Charlottesville, Va.
ANALYSIS OF THE OPERATION OF A SUPERHIGH FREQUENCY BIASED PHOTOCODUCTIVITY DETECTOR
Yu. V. Medvedev and A. S. Petrov 30 Jul. 1973 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Fiz. (USSR), no. 10, 1972 p 93-97
(AD-781822; FSTC-HT-23-1775-73) Avail: NTIS CSCL 09/5

An expression was obtained for the threshold sensitivity of superhigh frequency biased photoconductivity detectors, taking into account the noise of the detector, microwave amplifier, and video amplifier. Author (GRA)

N74-33760# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RESEARCH ON BROADBAND ANTENNA SYSTEMS Final Report, 1 Sep. 1972 - 31 Jan. 1974
John D. Dyson, Fred R. Ore, and Medford D. Johnson 25 Mar. 1974 70 p refs Prepared by Ill. Univ., Urbana
(Contract F19628-73-C-0002; AF Proj. 627A)
(AD-781181; ESD-TR-74-154; UIEM-74-8; UILU-ENG-74-2542) Avail: NTIS CSCL 09/5

A computer-aided technique was developed for the design of matching networks that are adaptive, in the sense that the network can be controlled by a change in one or more voltages. These control voltages are automatically varied with a change in the frequency of operation, over wide bandwidths, in such a manner that the match between a complex impedance load and source can be improved over that obtainable with a fixed passive network. A small diameter, slow-wave, conical helix antenna was designed that provides essentially axially directed radiation. The matching technique has been applied to the design of an adaptive network for this antenna with excellent results over a bandwidth from 150 to 223 MHz. GRA

N74-33761# Naval Air Development Center, Warminster, Pa. Aero-Electronic Technology Dept.
POINT SOURCE IMAGING WITH ELECTRON BOMBARDED SILICON CAMERA TUBES Final Report
Stephen B. Campana 17 Apr. 1974 44 p refs
(AD-781678; NADC-74004-20; ESD-TR-74-50) Avail: NTIS CSCL 09/1

Low light level camera tubes employing a 27 mm diameter electron beam semiconductor EBS target have been tested at NAVAIRDEVCEN to determine their capabilities for imaging faint point images. Horizontal and vertical point spread profiles have been determined. The degree of image spreading (blooming) on overload was also determined. The results indicate that at standard television rates, large target EBS tubes are capable of detecting 16th visual magnitude stars through the atmosphere with a 48-inch, F/2.5 telescope. Extending the integration time to one second may enable these tubes to detect 19th magnitude stars. Author (GRA)

N74-33762# Texas Univ., Austin. Applied Research Labs.
A DIGITALLY CONTROLLED TIME VARYING GAIN AMPLIFIER
David F. Rohde 18 Mar. 1974 91 p refs
(Contract N60921-73-C-0107; Proj. CAPTOR)
(AD-781234; ARL-TR-74-3) Avail: NTIS CSCL 09/5

The project concerns the design, testing, and application of a digitally controlled time varying gain amplifier. Because the system has direct use in pulse sonar receivers, the acoustic parameters which enter into the design considerations are discussed. The effects of operational amplifier limitations on the system are developed, and several methods for digitally controlling the amplifier gain are studied. One typical application is developed and a particular circuit design, as well as test data from system verification tests, are presented. Author (GRA)

N74-33763# Control Data Corp., Minneapolis, Minn. Aerospace Div.
LARGE AREA PLASMA DISPLAY MODULE Final Technical Report, 16 Feb. 1972 - 26 Nov. 1973
Richard A. Strom and Clark Bergman Apr. 1974 52 p refs
(Contract F30602-72-C-0211; AF Proj. 5597)
(AD-782383; G01334; RADC-TR-74-93) Avail: NTIS CSCL 09/5

The report describes the design, construction, and successful operation of a plasma display module having 256 by 1024 randomly addressable elements with a resolution of 33 lines per inch. The capacitively coupled display elements are neon orange with a peak light intensity of about 60 foot-lamberts and a contrast ratio of about 20 to 1. The module can be stacked on its long axis with other modules to form larger display panels. The discontinuity of the display matrix between modules can be made as small as 0.030 inch. Complete drive electronics were fabricated for one display module. It is organized so that any one of the quarter million elements can be randomly selected and written or erased. The write cycle time is 355 microseconds and the erase cycle time is 230 microseconds. The update time for writing 10 percent of the display module is 9.5 seconds. The sustain driver for the panel is capable of lighting up to 50 percent of the panel without significant loss of operating margin. (Modified author abstract) GRA

N74-33764# Research Triangle Inst., Durham, N.C.
TRANSIENT SURFACE DAMAGE Final Report, 1 Dec. 1972 - 31 Dec. 1973
Mayrant Simons Jan. 1974 95 p refs
(Contract N00014-73-C-0236)
(AD-782285; RTI-43U-812-FR) Avail: NTIS CSCL 09/1

The report describes the results of a study of transient surface damage phenomena in contemporary MOS and CMOS devices following pulsed radiation exposure. Measurements made on individual N- and P-channel transistor structures between 0.0001 sec and 1000 sec after irradiation show that there are widespread variations in radiation sensitivity and space charge annealing behavior among samples prepared by different processes and by different manufacturers. Response data for devices fabricated on bulk silicon and silicon-on-sapphire (SOS) substrates and for various SiO2 and Al2O3 gate insulators are compared and discussed. The effects of radiation-induced charge in the sapphire substrate of an SOS device are explored. Author (GRA)

N74-33765# Texas Technological Univ., Lubbock. Dept. of Electrical Engineering.
OPTIMUM FILTER MODELING OF INTEGRATED CIRCUITS Final Report, 1 Dec. 1970 - 31 May 1972
K. S. Chao, S. R. Liberty, R. H. Seacat, and M. A. Chipman (AFWL) Jun. 1974 117 p refs Sponsored in part by DNA
(Contract F29601-71-C-0048; AF Proj. 5710)
(AD-782095; AFWL-TR-72-121) Avail: NTIS CSCL 09/5

The report provides a complete and unified description of variations on the Wiener theory for modeling nonlinear systems. In particular, applications to the modeling of integrated circuit operational amplifiers in an ionizing radiation environment are considered. Detailed investigations of four modifications of the Wiener method are discussed here (Lee's method, the indirect method, Bose's method, and the matrix method), as well as extensions of the Wiener theory to include time varying and multiple-input multiple-output systems. It is shown that the matrix method is the best of the methods investigated. A modeling technique based upon this method is presented including a FORTRAN subprogram which can be used in conjunction with the SCEPTRE circuit analysis program for application as indicated above. Author (GRA)

N74-33766# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
ACOUSTIC VELOCITY CORRELATOR Semiannual Technical Report, 1 Oct. 1972 - 31 Jul. 1973
Melvin E. Pedinoff, Thomas W. Bristol, and Phillip B. Snow Jun. 1974 42 p
(Contract DAAB07-72-C-0121; DA Proj. 7X6-23304-D-215)
(AD-782232; ECOM-0121-2-72) Avail: NTIS CSCL 09/1

The Doppler velocity correlator is a surface acoustic wave device whose ultimate function is to correct the phases of signals obtained from a pulse burst processor type of multiply tapped surface acoustic wave delay line and to sum these phase corrected signals in a single Doppler velocity channel. Because of the need for numerous Doppler output channels, the device should and can consist of many input and output channels. The purpose of the program reported here is to demonstrate the feasibility of this concept. During this reporting period, prototype 8- and 16-channel velocity correlator networks were fabricated and tested. A major effort was devoted to the development of a photolithographic process which was capable of producing the required transducer arrays. This investigation is presented in detail, followed by a description of the chassis designs used for the prototype networks. Comprehensive time and frequency domain testing of the prototype networks are then presented and the results are evaluated in light of the specified performance. Author (GRA)

N74-33767# Harry Diamond Labs., Washington, D.C.
TECHNIQUES AND DESIGN OF EXTREMELY LIGHTWEIGHT HORN ANTENNAS WITH LOW SIDE LOBES

Howard S. Jones, Jr. Feb. 1974 20 p refs
(DA Proj. 1W3-62301-A-300; HDL Proj. A20415)
(AD-781905; HDL-TR-1659) Avail: NTIS CSCL 09/5

Several extremely lightweight prototype electromagnetic horns with low side lobes were designed and fabricated. Those lightweight horns are made by copperplating on low-density, low-loss dielectric foam substrates of a given shape and size. Corrugated walls are incorporated in the E-plane of the horn to eliminate scattering at the edges, thus substantially reducing side lobes and back radiation. Design techniques and dielectric material characteristics are discussed, and performance data of models designed for different frequency bands are illustrated. Results show that these design techniques realize as much as 10 to 1 reductions in weight in comparison with the conventional thick-walled horns. Moreover, the copperplated dielectric-foam horns are efficient, highly directional with good radiation pattern characteristics, and can be made to operate over a reasonably broad bandwidth. Author (GRA)

N74-33768# Raytheon Co., Waltham, Mass. Microwave Devices Operation.
SOLID STATE X-BAND DRIVER Final Report, 1 Jan. 1972 - 31 Jul. 1973
W. C. Tsai 19 Sep. 1973 72 p refs
(Contract DAAB07-72-C-0120)
(AD-782254; SM-400) Avail: NTIS

Four exploratory developmental x-band avalanche diode amplifiers were constructed. The amplifier delivers 5 Watts output power with 10 to 15 db of gain across the frequency range of 7.9 to 8.4 GHz. The RF swept gain versus frequency data for all four units is included. The maximum amplifier efficiency observed is 7%. The phase linearity curve was measured for one unit and the data is included. The method of approach as well as the design and fabrication procedures are described. (Modified author abstract) GRA

N74-33769# California Univ., Los Angeles. School of Engineering and Applied Science.
LONG TERM MEMORY IN JUNCTION DEVICES USING MULTIVALENT TRAPPING IMPURITIES IN SILICON Semiannual Report, 1 Jul. 1973 - 28 Feb. 1974
J. W. Holm-Kennedy Jun. 1974 47 p refs
(Contract DAAB07-73-C-0306; DA Proj. 1S7-62705-AH-94)
(AD-782255; UCLA-ENG-7420; ECOM-0306-1-73; SAR-1)
Avail: NTIS CSCL 09/1

The purpose of the project is to study the effect of multivalent trapping on long term memory in junction devices. In the course of the field induced trapping (F.I.T.) nonvolatile switching investigations, three new types of behavior have been observed; Irreversible switching in n-Si epitaxial structures doped with Cu, apparently due to a conductive filament formation; reversible switching of a character different than normally observed in F.I.T. devices; and, large magnitude oscillations (KHz) in Schottky diodes under large forward bias (35 volts). Further, a new electronic instrument, an automated pulse potentiometer, has been designed constructed and tested under high voltage conditions. GRA

N74-33770# Transportation Systems Center, Cambridge, Mass.
ANALOG RANGING MODEM CODE PROCESSOR AND GENERATOR Final Report, 1 Jul. 1971 - 30 Jun. 1972
P. G. Mauro May 1974 45 p refs
(AD-782039; TSC-FAA-73-7; FAA-RD-74-55) Avail: NTIS CSCL 09/5

The report details technical development efforts to implement an analog ranging modem using recently developed linear integrated circuits where possible. The breadboard hardware is capable of acquiring frequency and phase of a weak signal in a high noise environment, i.e., a C/No ratio of 37 db-Hz, as verified in laboratory noise tests. The report includes a description of the system and of the hardware implementation. The ranging technique implemented and tested has direct application to the AEROSAT system. It represents one possible approach to sidetone ranging. The test setup and test results are given along with a summary, recommendations and conclusions. Schematics of the circuitry, test data and analyses are included. Author (GRA)

N74-33771# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE NUMBER OF STEADY STATES OF A SPECTROTRON WITH INTERNAL FEEDBACK
A. A. Molchanov 28 Jun. 1974 11 p refs Transl. into ENGLISH of Mnogoustoichivye Elementy i ikh Primenenie. Sbornik Statei, USSR, 1971 p 55-60
(FTD Proj. T74-05-12)
(AD-782548; FTD-HT-23-1009-74) Avail: NTIS CSCL 09/5

The use of frequency-harmonic multi-stable components - spectrotrons - in devices of frequency automation and computer technology is discussed. The study is devoted to an analysis of the stationary mode of spectrotrons with internal feedback; theoretical relationships for determining the coordinates and a number of steady states of an element as a function of the parameters of its circuits and supply voltage were derived. A mathematical formula was used to calculate the number of steady states N of a spectrotron with the controlled capacitator of the p-n junctions of a semiconductor diode. Author

N74-33982* Joint Publications Research Service, Arlington, Va.
TWO-POSITION dc PULSE VOLTAGE STABILIZER
V. I. Osadchiy *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 31-36 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 6 p (For availability see N74-33976 23-15)
CSCL 09E

N74-33985* Joint Publications Research Service, Arlington, Va.
STATIC dc VOLTAGE STABILIZER-CONVERTER
V. I. Osadchiy *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 54-58 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 5 p (For availability see N74-33976 23-15)
CSCL 09E

N74-33987* Joint Publications Research Service, Arlington, Va.
TRANSISTORIZED BLOCKING GENERATOR
A. V. Popkov *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 66-68 ref Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 3 p (For availability see N74-33976 23-15)
CSCL 09E

N74-33993* Joint Publications Research Service, Arlington, Va.
METHOD OF BOUNDARY TESTING OF THE ELECTRIC CIRCUITS AND ITS APPLICATION FOR CALCULATING ELECTRIC TOLERANCES
N. P. Redkina *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 92-99 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 8 p (For availability see N74-33976 23-15)
CSCL 09C

N74-33995* Joint Publications Research Service, Arlington, Va.
OPTIMAL REGIME AND CONDITIONING TIME OF TRANSISTORS FOR EQUIPMENT WITH INCREASED RELIABILITY
A. V. Breslavets, V. N. Grigoryev, E. I. Kuzyuta, and E. M. Yampolskaya *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 103-110 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 8 p (For availability see N74-33976 23-15)
CSCL 09A

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N74-33772*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIGITAL INTEGRATED CONTROL OF A MACH 2.5 MIXED-COMPRESSION SUPERSONIC INLET AND AN AUGMENTED MIXED-FLOW TURBOFAN ENGINE
Peter G. Batterton, Dale J. Arpasi, and Robert J. Baumbick Washington Oct. 1974 91 p refs
(NASA-TM-X-3075; E-7965) Avail: NTIS HC $4.00 CSCL 21E

A digitally implemented integrated inlet-engine control system was designed and tested on a mixed-compression, axisymmetric, Mach 2.5, supersonic inlet with 45 percent internal supersonic area contraction and a TF30-P-3 augmented turbofan engine. The control matched engine airflow to available inlet airflow. By monitoring inlet terminal shock position and over-board bypass door command, the control adjusted engine speed so that in steady state, the shock would be at the desired location and the overboard bypass doors would be closed. During engine-induced transients, such as augmentor light-off and cutoff, the inlet operating point was momentarily changed to a more supercritical point to minimize unstarts. The digital control also provided automatic inlet restart. A variable inlet throat bleed control, based on throat Mach number, provided additional inlet stability margin. Author

N74-33773# Bendix Corp., Kansas City, Mo.
LSI INTEGRATED CIRCUIT TEST DEVELOPMENT
A. V. Grimm Mar. 1974 62 p
(Contract AT(29-1)-613)
(BDX-613-1017) Avail: NTIS HC $6.25

Handling and testing techniques were investigated to prevent static electricity overstressing of MOS integrated circuits. Six areas of testing were involved and automated testing procedures were developed. Author (NSA)

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N74-33774# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).
WINDTUNNELS [WINDKANAELE]
W. Wyborny 1973 90 p In GERMAN
Avail: NTIS HC $7.50

The organization and functions of a research facility for aeronautical studies are discussed. Emphasis is placed on the five types of wind tunnels operated by the facility. The tunnels are identified as: (1) subsonic wind tunnels, (2) trans and supersonic wind tunnels, (3) hypersonic wind tunnels, (4) low density and high enthalpy wind tunnels, and (5) cascade flow wind tunnels. The apparatus installed in the tunnels and the capabilities of the tunnels are described. The main fields of research and testing conducted in each tunnel is defined. Author

N74-33775*# Boeing Aerospace Co., Houston, Tex.
ANALYSES OF THE DYNAMIC DOCKING TEST SYSTEM FOR ADVANCED MISSION DOCKING SYSTEM TEST PROGRAMS
R. M. Gates and J. E. Williams 30 Aug. 1974 96 p refs
(Contract NAS9-13136)
(NASA-CR-140286; D2-118470-2) Avail: NTIS HC $8.00 CSCL 14B

Results are given of analytical studies performed in support of the design, implementation, checkout and use of NASA's dynamic docking test system (DDTS). Included are analyses of simulator components, a list of detailed operational test procedures, a summary of simulator performance, and an analysis and comparison of docking dynamics and loads obtained by test and analysis. Author

N74-33776*# Boeing Aerospace Co., Houston, Tex.
MATHEMATICAL MODEL FOR THE SIMULATION OF DYNAMIC DOCKING TEST SYSTEM (DDST) ACTIVE TABLE MOTION
R. M. Gates and D. L. Graves 30 Aug. 1974 57 p
(Contract NAS9-13136)
(NASA-CR-140288; D2-118544-1) Avail: NTIS HC $6.00 CSCL 14B

The mathematical model developed to describe the three-dimensional motion of the dynamic docking test system active table is described. The active table is modeled as a rigid body supported by six flexible hydraulic actuators which produce the commanded table motions. Author

N74-33777*# Boeing Aerospace Co., Houston, Tex.
DYNAMIC DOCKING TEST SYSTEM (DDTS) ACTIVE TABLE FREQUENCY RESPONSE TEST RESULTS
R. M. Gates 30 Aug. 1974 242 p refs
(Contract NAS9-13136)
(NASA-CR-140285; D2-118546-1) Avail: NTIS HC $15.25 CSCL 14B

Results are presented of the frequency response test performed on the dynamic docking test system (DDTS) active table. Sinusoidal displacement commands were applied to the table and the dynamic response determined from measured actuator responses and accelerometers mounted to the table and one actuator. Author

N74-33778# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
A NOTE ON THE WORKING-SECTION TURBULENCE IN A LUDWIEG TUBE
P. Bradshaw Jan. 1974 15 p refs
(IC-Aero-74-01) Avail: NTIS HC $4.00

The boundary layer in the charge tube of a Ludwieg tube may reach the center line before the end of the run, so that the flow is close to fully-developed pipe flow therefore resembles that after the fourth corner of a conventional wind tunnel. It is deduced that Ludwieg tubes need antiturbulence devices similar to those of conventional wind tunnels, rather than 3:1 contraction without screens proposed in recent project studies. Devices suitable for flows at high dynamic pressure are briefly discussed. Author (ESRO)

N74-33779# Institut Franco-Allemand de Recherches, St. Louis (France).
CALCULATION OF THE DETONATION OF AN EXPLOSIVE CHARGE IN A TUNNEL. PART 3: COMPARISON WITH EXPERIMENTS [CALCUL DE LA DETONATION D'UNE CHARGE EXPLOSIVE DANS UN TUNNEL. TROISIEME PARTIE: CONFRONTATION AVEC L'EXPERIENCE]
L. Bobin 17 Oct. 1973 46 p refs In FRENCH
(Contract DTEN-73.151)
(ISL-35/73) Avail: NTIS HC $5.50

In order to obtain strong shock waves, a shock tube was constructed driven by explosives. Shock waves having a top overpressure of 50 mbar were obtained in this tube, which has a diameter of 300 mm and a length of 70 m. The wave attenuation along the tube was measured. Numerical computer programs were developed to completely determine the efficiency of this type of shock tube. The results are described and compared with the experimental results. Good agreement was found for shock wave intensity and propagation velocity; small differences were found in the shock wave profile shapes. ESRO

N74-33780# Michigan Univ., Ann Arbor. Transportation Inst.
URBAN TRANSPORTATION POLICY: AN ANNOTATED BIBLIOGRAPHY
Peter A. L. Stroh Nov. 1973 120 p refs Sponsored by DOT
(PB-232264/2; UMTA-MI-11-0001-73-1) Avail: NTIS HC $4.50 CSCL 13B

The purpose of the bibliography is to provide a collection of material dealing exclusively with urban transportation policy. It is designed to enable policy analysts, planners and government officials to understand how urban transportation policy is formed and how current arrangements may be altered to influence future outcomes. The bibliography is organized to emphasize the demands that shape policy, the institutional framework that constrains policy alternatives and how these factors shape supply strategies. Sections present overviews of urban transportation problems and prospects, literature on the demand or input side of transportation, transportation decision-making and management, policy-making arrangements in the U.S., transportation facilities and foreign transportation policies. GRA

N74-33781# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOME CHARACTERISTICS OF THE TECHNOLOGY OF FABRICATING WIND TUNNEL NOZZLES
I. D. Panin and G. P. Tretyakov 20 Jun. 1974 12 p Transl. into ENGLISH from Izv. Sibirsk. Otd. Akad. Nauk SSSR. Ser. Tekhn. Nauk (USSR), no. 3, 1973 p 136-139
(AF Proj. G101)
(AD-782049; FTD-HC-23-1797-74) Avail: NTIS CSCL 14/2

The process of fabricating a nozzle, even one of simple design, is complicated and difficult because of the unique geometry of the channel. From primitive manual machining to mechanized duplicate machining is the path of development of the technology of fabricating nozzles. On the basis of specific examples, the final stages of nozzle fabrication -- machining of the working curvilinear surfaces of the nozzles, master forms and templates -- are considered. Other stages are not of special interest. GRA

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N74-33782 British Library Lending Div., Boston Spa (England).
A QUANTITATIVE METHOD OF INVESTIGATING RECIRCULATION DURING HYDRAULIC MODELLING
G. M. Ryzhkov, A. I. Vashchenko, V. N. Astsaturov, and N. G. Vaisman [1974] 5 p ref Transl. into English from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 9, 1973 p 173-174
(BLL-M-21845-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

A quantitative method of investigating recirculation during hydraulic modelling, and the calculation of this recirculation are examined. Author

N74-33783 Polish Academy of Sciences, Warsaw.
RELAXATION EFFECTS IN GAS FLOW
Ernst Becker 1973 32 p refs Presented at the 11th Symp. on Advanced Probl. and Methods in Fluid Mech., Kamienny Potok, Poland, 3-8 Sep. 1973
(Rept-30/1973) Avail: Issuing Activity

Relaxation gas dynamics are described in relation to the classical theory of fluid flow, based on the assumption that each fluid particle is in a thermodynamic equilibrium, such that the mass concentrations of the constituents are functions of pressure and density, determined by the law of mass action. Chemically reacting mixtures are considered where mass concentration is no longer a function of pressure and density, due to a rapid chemical change in the mixture. The calculations are presented for the time it takes for the concentrations to adjust to, or relax toward, new values of the external variables, with additional consideration of the internal variables of state. A.A.D.

N74-33784 Polish Academy of Sciences, Warsaw.
STRUCTURE OF SHOCK WAVES INCLUDING DISSOCIATION AND IONIZATION
F. Schultz-Grunow 1973 35 p refs Presented at 11th Symp. on Advanced Probl. and Methods in Fluid Mech., Kamienny Potok, Poland, 3-8 Sep. 1973
(Rept-33/1973) Avail: Issuing Activity

Density distributions, shock reflection, ionization and dissociation of monatomic and disatomic gases were studied in shock layers. The measurements and calculations of density, temperature, reaction rates, and relaxation times are compared. Graphs, showing the shock wave structure are presented. F.O.S.

N74-33785 Polish Academy of Sciences, Warsaw.
THE 11TH SYMPOSIUM ON ADVANCED PROBLEMS AND METHODS IN FLUID MECHANICS: ABSTRACTS OF SURVEY LECTURES
1973 13 p refs Symp. held at Kamienny Potok, Poland, 3-8 Sep. 1973
(Rept-34/1973) Avail: Issuing Activity

Fluid mechanics summaries, covering statistical foundations of hydrodynamics, understanding turbulent shear flow, and expansion of gas jet into a vacuum or a near vacuum, are reported. E.H.W.

N74-33786 Polish Academy of Sciences, Warsaw.
A TRUNCATED-SERIES SOLUTION OF THE TWO-DIMENSIONAL LAMINAR JET IN OUTER FLOW
J. Maczynski and M. Augustyn 1973 47 p
(Rept-53-1973) Avail: Issuing Activity

Truncated series in matrix formulation was explored as a method of solving laminar flow in the two-dimensional jet of an incompressible flow. Relative advantages of such an approach both as regards ease of programming, accuracy, speed of calculation, and the possibility of summarizing the results in a simple rule of thumb formula were investigated. Results show that although the algebra may seem involved the result appears in a simple form which is easy to handle and discuss. Similar results were obtained in the boundary layer problem. A particular feature of the truncated series method outlined is the asympotic behavior at large lateral distances which differentiates it from other truncated expansions. Author

N74-33787*# Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
FLOW IN A DISCRETE SLOTTED NOZZLE WITH MASSIVE INJECTION
H. C. Perkins Aug. 1974 36 p refs
(Grant NGR-03-002-213)
(NASA-CR-134505) Avail: NTIS HC $5.00 CSCL 20D

An experimental investigation has been conducted to determine the effect of massive wall injection on the flow characteristics in a slotted nozzle. Some of the experiments were performed on a water table with a slotted-nozzle test section. This has 45 deg and 15 deg half angles of convergence and divergence, respectively, throat radius of 2.5 inches, and throat width of 3 inches. The hydraulic analogy was employed to qualitatively extend the results to a compressible gas flow through the nozzle. Experimental results from the water table include contours of constant Froude and Mach number with and without injection. Photographic results are also presented for the injection through slots of CO2 and Freon-12 into a main-stream air flow in a convergent-divergent nozzle in a wind tunnel. Schlieren photographs were used to visualize the flow, and qualititative agreement between the results from the gas tunnel and water table is good. Author

N74-33788*# Polytechnic Inst. of New York.
UNSTEADY SUBSONIC AND TRANSONIC POTENTIAL FLOW OVER HELICOPTER ROTOR BLADES
Morris P. Isom Washington NASA Oct. 1974 29 p refs
(Contract NAS2-6813)
(NASA-CR-2463; Rept-74-2) Avail: NTIS HC $3.25 CSCL 20D

Differential equations and boundary conditions for a rotor blade in forward flight, with subsonic or transonic tip Mach number, are derived. A variety of limiting flow regimes determined by different limits involving blade thickness ratio, aspect ratio, advance ratio and maximum tip Mach number is discussed. The transonic problem is discussed in some detail, and in particular the conditions that make this problem quasi-steady or essentially unsteady are determined. Asymptotic forms of equations and boundary conditions that are valid in an appropriately scaled region of the tip and an azimuthal sector on the advancing side are derived. The equations are then put in a form that is valid

from the blade tip inboard through the strip theory region.
Author

N74-33789*# Pratt and Whitney Aircraft, East Hartford, Conn.
TWO STAGE LOW NOISE ADVANCED TECHNOLOGY FAN. 1: AERODYNAMIC, STRUCTURAL, AND ACOUSTIC DESIGN
H. E. Messenger, J. T. Ruschak, and T. G. Sofrin 30 Sep. 1974 172 p refs
(Contract NAS3-16811)
(NASA-CR-134662; PWA-5069) Avail: NTIS HC $12.00 CSCL 20D

A two-stage fan was designed to reduce noise 20 db below current requirements. The first-stage rotor has a design tip speed of 365.8 m/sec and a hub/tip ratio of 0.4. The fan was designed to deliver a pressure ratio of 1.9 with an adiabatic efficiency of 85.3 percent at a specific inlet corrected flow of 209.2kg/sec/sq m. Noise reduction devices include acoustically treated casing walls, a flowpath exit acoustic splitter, a translating centerbody sonic inlet device, widely spaced blade rows, and the proper ratio of blades and vanes. Multiple-circular-arc rotor airfoils, resettable stators, split outer casings, and capability to go to close blade-row spacing are also included. Author

N74-33790# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON KELVIN WAVES IN BASINS WITH BOTTOM SHELVES
S. A. Gabov and P. I. Ruban [1974] 7 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Mat., Mekh. (USSR), no. 4, 1974 p 120-125
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

An infinite basin rotating counter-clockwise at the angular velocity around the vertical axis is considered, along with a Cartesian coordinate system (x, o, y) which rotates together with the basin. Steady wave motions of the fluid were also studied in terms of their low frequency oscillations. It is shown the Kelvin waves can be propagated during long wave propagation in rozating basins along the rectilinear walls bounding the basin, and are localized along the bottom shelves of the basin. Author

N74-33791*# Douglas Aircraft Co., Inc., Long Beach, Calif.
IMPROVED SOLUTION FOR POTENTIAL FLOW ABOUT ARBITRARY AXISYMMETRIC BODIES BY THE USE OF A HIGHER-ORDER SURFACE SOURCE METHOD. PART 1. THEORY AND RESULTS
John L. Hess and Robert P. Martin, Jr. Jul. 1974 46 p refs
(Contract NAS3-18018)
(NASA-CR-134694; MDC-J6627-01) Avail: NTIS HC $5.50 CSCL 20D

The surface-source method of calculating potential flow is improved by refining the underlying numerical analysis. The analysis uses parabolic elements and linearly-varying source density. The result is a large increase in computing speed and accuracy. The theory is described, and the effectiveness of the modification is illustrated. Author

N74-33792*# Douglas Aircraft Co., Inc., Long Beach, Calif.
IMPROVED SOLUTION FOR POTENTIAL FLOW ABOUT ARBITRARY AXISYMMETRIC BODIES BY THE USE OF A HIGHER-ORDER SURFACE SOURCE METHOD. PART 2. USER'S MANUAL FOR COMPUTER PROGRAM
Douglas M. Friedman Jul. 1974 31 p refs
(Contract NAS3-18018)
(NASA-CR-134695; MDC-J6627-02) Avail: NTIS HC $4.75 CSCL 20D

The surface-source method of calculating potential flow is improved by refining the underlying numerical analysis. The present analysis uses parabolic elements and linearly-varying source density which results in a large increase in computing speed and accuracy. The computer program including all relevant input and output is described. Author

N74-33793*# Kanner (Leo) Associates, Redwood City, Calif.
SOME RECENT RESULTS ON THE THEORY OF TURBULENT FLOW OF GASES OF HIGHLY VARIABLE DENSITY
Witold Szablewski Washington NASA Oct. 1974 34 p refs Transl. into ENGLISH of "Einige neuere Ergebnisse zur Theorie turbulenter Stroemungen von Gasen stark veraenderlicher Dichte". Rept. No. 7 Abhandlungen der Deutschen Akademie der Wissenschaften zu Berlin, Kl. fuer Mat., Physik und Tech., Berlin, 1963 p 1-24
(Contract NASw-2481)
(NASA-TT-F-15952) Avail: NTIS HC $4.75 CSCL 20D

Some theoretical results are obtained on turbulent flow in gases of variable density. The cases considered include turbulent boundary-layer flow and turbulent expansion of jets in a surrounding medium. In the latter case, a mixing wedge is obtained which swings toward the hotter jet as the temperature difference between the jet and the surrounding air increases. For boundary-layer flow, a new relation between temperature and velocity is derived and confirmed by experiment. Author

N74-33794*# Kanner (Leo) Associates, Redwood City, Calif.
TURBULENT MIXING OF GAS FLOWS IN THE PRESENCE OF A PRESSURE GRADIENT
G. P. Shinkin Washington NASA Oct. 1974 9 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (USSR), no. 3, May-Jun. 1973 p 153-156
(Contract NASw-2481)
(NASA-TT-F-15975) Avail: NTIS HC $4.00 CSCL 20D

The turbulent mixing of homegeneous gas flows in the presence of a longitudinal pressure gradient was examined. The equations of a turbulent boundary layer reduce to the laminar form. The dependence of velocity at the upper boundary of the mixing zone, M sub e is compared with previously published solutions. Author

N74-33795*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EFFECTS OF FORWARD SPEED ON FAN INLET TURBULENCE AND ITS RELATION TO TONE NOISE GENERATION
Brent K. Hodder Aug. 1974 21 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Moffett Field, Calif.
(NASA-TM-X-62381) Avail: NTIS HC $3.00 CSCL 20D

The effect of forward speed on fan inlet turbulence was studied to determine the feasibility of using a wind tunnel to simulate various flight conditions where turbulence of atmospheric origin enters the engine inlet. The investigation was conducted in the Ames 7- by 10-foot Wind Tunnel with a small-scale low pressure-ratio fan. Results indicate that a wind tunnel of this size does produce large turbulence scale appropriate for simulation of atmospheric scale. But the tunnel's low turbulence intensity seems to cause results contrary to existing theories on the effects of fan inlet velocity ratio on turbulence scale. Limited results with artificially increased turbulence intensity removed this contradiction. Acoustic measurements showed the impact of inlet turbulence on fantone noise. Author

N74-33796# National Aeronautical Lab., Bangalore (India).
APPLICATION OF INTEGRAL MOMENT METHOD TO THE HYPERSONIC LAMINAR NEAR WAKE OF A COLD CYLINDER
M. A. Ramaswamy Mar. 1974 72 p refs
(NAL-TN-44) Avail: NTIS HC $6.75

The integral moment method has been applied to solve the laminar near wake flow field of a circular cylinder cooled 0.2 times the free stream stagnation temperature at free stream Mach 6 and Reynolds number of 9000, 48,000 and 84,000 based on diameter and free stream conditions. Comparison with the experimental results of Ramaswamy at the lowest Reynolds number indicate that the base pressure and the temperature in the recirculating region are reasonably well predicted by the method, but there is some discrepancy in the detailed pressure and temperature recovery history in the near wake which could probably be eliminated with further refinement of the method.
Author

N74-33797*# Texas Univ., Austin.
A THEORETICAL AND FLIGHT TEST STUDY OF PRESSURE FLUCTUATIONS UNDER A TURBULENT BOUNDARY LAYER. PART 2: FLIGHT TEST STUDY Final Report
Ronald L. Panton, Richard L. Lowery (Oklahoma State Univ.), and M. M. Reischman [1967] 106 p refs
(Grant NGR-37-002-083)
(NASA-CR-140448) Avail: NTIS HC $8.50 CSCL 20D

The study of pressure fluctuations under a turbulent boundary layer was undertaken with the objective of extending previous work to lower frequencies. Wind tunnel and flight test measurements are invalid at low frequencies because of extraneous acoustic noises and free stream turbulence. A glider was instrumented and used as a test bed to carry microphones into a smooth flow free of acoustic noise. Hodgson had previously measured the spectrum of boundary layer noise on a glider wing. These tests showed a drop off at low frequencies that could not be reproduced in any other facility. The measurements were made on the forward fuselage of a glider where the boundary layer could develop naturally and have some length in a zero pressure gradient before the measurements were made. Two different sets of measurements were made. Author

N74-33798# European Space Research Organization, Paris (France).

THE PRESSURE DISTRIBUTION ALONG A SLENDER WEDGE HAVING HIGH DECELERATION IN THE SUPERSONIC REGION NEAR M=1

Manfred Wittmann Jul. 1974 43 p refs Transl. into ENGLISH of Der Druckverlauf Laengs eines Schlanken Keils bei Stark Verzoegertem Flug im Schallnahen Ueberschallgebiet, DLR-FB-73-78, DFVLR, 27 MAR. 1973

(ESRO-TT-82; DLR-FB-73-78) Avail: NTIS HC $5.25; DFVLR, Porz, West Ger. 15.30 DM

An equation for the local coefficient of pressure along a slender wedge, excluding the nose area, is derived for high decelerations for Mach numbers from 1 up to low supersonic. The pressure distribution is calculated in certain cases.

Author (ESRO)

N74-33799# Ecole Nationale Superieure de Techniques Avancees, Paris (France).

ASYMPTOTIC THEORY OF SUPERCAVITATING FLOWS Ph.D. Thesis - Paris Univ. [THEORIE ASYMPTOTIQUE DES ECOULEMENTS SUPERCAVITANTS]

J. Fouillet 1973 172 p refs In FRENCH

(Rept-020) Avail: NTIS HC $11.75

A study on supercavitating flow using asymptotic expansion methods is presented. The experimental, closed circuit system is detailed, and a review of physical models of the phenomenon is given with regard to the wake theory, the Riabouchinsky, Joukowsky, Roskho, and Eppler models, the re-entrant jet theory. The unlinearized theory of symmetric flows is discussed in terms of formal solution and compatibility conditions. The case, in which the cavitation parameter is small, is formulated in view of the supercavitating profile theory. Mathematical hypotheses are laid down, and the influence of tube length is stressed. The asymptotic theory with long tubes is introduced, and various models of wakes are detailed. The results are modified to take into account the presence of walls or obstacles (rectilinear walls, free surfaces, semi-infinite medium, and obstacle at mid-distance between walls). ESRO

N74-33800# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Turbulenzforschung.

THE CONTROL OF A THIN FREE SHEAR LAYER WITH AND WITHOUT A SEMI-INFINITE PLATE WITH A PULSATING MONOPOLE OR DIPOLE. SOME NEW CLOSED FORM SOLUTIONS

Dietrich Bechert and Ulf Michel Porz 19 Feb. 1974 76 p refs

(DLR-FB-74-22) Avail: NTIS HC $7.00; DFVLR, Porz, West Ger. 18 DM

A general solution for the fluctuations of an infinitely thin shear layer excited by an exterior forcing motion is given. Incompressibility of the fluid and symmetry of the boundary conditions at both sides of the boundary layer are assumed. Two configurations are considered: A free shear layer extended from - infinity to + infinity, and a free shear layer starting from a semi-infinite plate. The shear layer is excited artificially by pulsating monopoles and dipoles. In the case of a shear layer starting from a semi-infinite plate, forced oscillations are caused by external excitation only. Closed form solutions of the above mentioned problems are obtained. Author (ESRO)

N74-33801# Bundesminister fuer Verteidigung, Bonn (West Germany).

CALCULATION OF PRESSURE AND SHEAR STRAIN DISTRIBUTION ON BODIES WITH DEAD WATER IN PLANE INCOMPRESSIBLE PARALLEL FLOW [BERECHNUNG DER DRUCK - UND SCHUBSPANNUNGS - VERTEILUNG AUF KOERPERN MIT TOTWASSER IN EBENER INKOMPRESSIBLER PARALLELSTROEMUNG]

J. Grashof and Alfred Walz 1974 120 p refs In GERMAN; ENGLISH summary

(BMVg-FBWT-74-3) Avail: NTIS HC $9.00; Bundeswehramt 40 DM

The two dimensional, steady, imcompressible, and unbounded parallel flow of a Newtonian fluid around a rigid and closed contour of a body of finite length was investigated. The separated flow was considered as quasi-steady, i.e. time dependent influence upon the remaining flow was neglected. Two essential properties of such dead air flows are of basic importance: (1) a pressure distribution of the separated flow typical of dead air flows, and (2) a free stagnation point between the distant wake and the dead air region. The location of this point was calculated iteratively by minimizing the deviation from the correct values of the boundary conditions. The numerical method consists of a combination of three basic procedures: (1) calculation of the potential flow (conformal mapping), (2) calculation of the boundary layer, and (3) solving the mixed boundary value problem. ESRO

N74-33802# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.

AN IMPROVED FORTRAN PROGRAM FOR THE BRADSHAW-FERRISS-ATWELL METHOD OF CALCULATING TURBULENT SHEAR LAYERS

P. Bradshaw and K. Unsworth Feb. 1974 43 p refs Supersedes NPL-AERO-1269; IC-AERO-71-24

(Contracts MIN-DEF/PE-AT/2037/0102; MIN-DEF/PE-AT/2037/0133)

(IC-Aero-74-02; NPL-Aero-1269; IC-Aero-71-24) Avail: NTIS HC $5.25

The improved program includes allowances for the effect of small extra strain rates: it was rearranged into subroutines for ease of modification, the input was simplified and the speed of execution increased. A full description and running instructions are given for the basic program for two-dimensional incompressible boundary layers. Further extensions are at present: solution of a length-scale equation, for rapidly changing flows, and calculation of heat transfer in compressible or incompressible flow, using an eddy conductivity assumption. Author (ESRO)

N74-33803# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.

A NOTE ON THE EMPIRICAL CONSTANTS APPEARING IN THE LOGARITHMIC LAW FOR TURBULENT WALL FLOWS

V. DeBrederode and P. Bradshaw Feb. 1974 14 p refs Partly sponsored by the Port. Min. of Educ.

(IC-Aero-74-03) Avail: NTIS HC $4.00

Consistent discrepancies of about 2 percent were documented between values of skin friction coeficients in incompressible turbulent flows deduced from Preston tube measurements. It is shown that the discrepancy cannot be explained by any of the admitted uncertainties in procedures, and since Patel's direct calibration has received numerous confirmations while Coles's constants were chosen indirectly, it is suggested that Coles's law of the wall should be modified to force agreement with Patel's calibration. This could be done by increasing Cole's additive constant from 5.0 to 5.2. Author (ESRO)

N74-33804# Naval Postgraduate School, Monterey, Calif.

APPLICATION OF HOLOGRAPHIC INTERFEROMETRY TO SUPERSONIC FLOW VISUALIZATION OF A REAR-FACING STEP AND APPLICATION OF FAST FOURIER TRANSFORM METHODS TO CURRENT DATA REDUCTION TECHNIQUES M.S. Thesis

Harland Wilber Jones, Jr. Mar. 1974 90 p refs

(AD-781396) Avail: NTIS CSCL 20/4

The successful application of holographic interferometry to the study of three-dimensional density fields around bodies in

wind tunnel experiments has been reported in the literature. The present report has extended the application of holography as a flow visualization technique by investigating Mach 2.8 flow over a rear-facing 1/8 in. step. Two single-exposed holograms of the model and two double-exposed frozen fringe holographic interferograms of the flow were created. Fast Fourier Transform (FFT) methods have been reported as significantly reducing computational time. Two computer programs were designed to apply FFT methods to the Fourier transform approach to the basic interferometric equation. (Modified author abstract) GRA

N74-33805# Naval Weapons Lab., Dahlgren, Va.
A COMMENT ON THE LAGALLY THEOREM
A. V. Hershey May 1974 11 p refs
(AD-781851; NWL-TR-3133) Avail: NTIS CSCL 20/4

A stationary source in a uniform flow field has been analyzed. The force which is associated with the source is given by the Lagally theorem, but the force which is applied to a streamline boundary is zero. The Lagally theorem must be used with caution in other applications. Author (GRA)

N74-33806# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
TRANSONIC LAMINAR VISCOUS-INVISCID INTERACTION OVER AIRFOILS Final Report
Tsze C. Tai Jun. 1974 68 p refs
(R230201)
(AD-782357; Aero-1195; NSRDC-4362) Avail: NTIS CSCL 20/4

A theoretical model consisting of an inviscid external flow and a viscous boundary layer flow is formulated for the problem of transonic laminar viscous-inviscid interaction over airfoils. Both attached and separated boundary layers are considered for either weak or strong interactions. The governing equations for both inviscid and viscous flows are all reduced to first-order ordinary differential equations and integrated simultaneously in the case of strong interactions. The weak interaction is accounted for by simply correcting the airfoil surface with the boundary layer displacement thickness. The pertinent two-point boundary value problem is then solved by the initial value technique. (Modified author abstract) GRA

N74-33807# Iowa State Univ. of Science and Technology, Ames. Heat Transfer Lab.
A BOUNDARY LAYER FINITE DIFFERENCE METHOD FOR CALCULATING THROUGH THE SEPARATION POINT AND INTO THE REGION OF RECIRCULATION IN IMCOMPRESSIBLE LAMINAR FLOW
C. L. Dancey and R. H. Pletcher Jun. 1974 182 p refs
(Grant NSF GK-18810)
(PB-233066/0; ISU-ERI-AMES-74103; HTL-2) Avail: NTIS HC $5.50 CSCL 20D

A finite difference calculation procedure is presented for computing past the separation point for imcompressible laminar boundary layer flows. The method includes an iterative interaction calculation whereby the pressure gradient is altered by the boundary layer growth, resulting in the removal of the separation point sigularity and a shift in the predicted separation point downstream (compared with ordinary boundary layer predictions) more in line with recent Navier-Stokes solutions for laminar flows. The use of a reversed flow model permits integration beyond the separation point, into the recirculating flow region, while retaining the marching method of solution. (Modified author abstract) GRA

N74-33808# California Univ., Berkeley. Dept. of Mechanical Engineering.
AN ANALYSIS OF TURBULENT FLOW WITH SHEAR
Alexandre Joel Chorin Jun. 1974 44 p refs
(Contract N00014-69-A-0200-1052)
(AD-782283; FM-74-9) Avail: NTIS CSCL 20/4

A simple statistical assumption is introduced, concerning the distribution of certain functionals of a turbulent flow field. This assumption is then used to formulate a system of difference equations which describes the moments of a turbulent flow with shear. No empirical parameters are used. An application to turbulent flow in a channel is carried out, and yields results in good agreement with experiment. A discussion of the relationship between the main assumption and theories of homogeneous turbulence is also given. Author (GRA)

N74-33809# Ohio State Univ., Columbus. Dept. of Aeronautical and Astronautical Engineering.
ASYMPTOTIC SOLUTION FOR SUPERSONIC VISCOUS FLOW PAST A COMPRESSION CORNER
R. Jenson, O. R. Burggraf, and D. P. Rizzetta Jul. 1974 10 p refs
(Contract N00014-67-A-0232-0014; NR Proj. 061-194; OSURF Proj. 3308)
(AD-782479; TR-2) Avail: NTIS CSCL 20/4

The boundary-layer flow is forced to separate from the wall when a downstream compressive disturbance of sufficient magnitude is encountered. The correct asymptotic mathematical structure for such a viscous-inviscid interacting flow has been developed by Stewartson and Williams in their paper on self-induced separation. A numerical solution of these asymptotic equations of motion is presented here for the case of separation produced in supersonic flow past a compression ramp. The flow through separation ahead of the corner agrees with the Stewartson and Williams solution, but the reattachment of the separated flow onto the ramp is of different nature than the downstream flow in their case. Author (GRA)

N74-33810# KLD Associates, Inc., Huntington, N.Y.
NOISE PRESSURE FLUCTUATIONS FOR A FINITE-THICKNESS SYMMETRIC BODY PENETRATING A SINUSOIDAL TRANSVERSE VELOCITY FIELD Semiannual Report
Frank Lane Jul. 1974 47 p refs
(Contract DAAH01-74-C-0480; ARPA Order 2126)
(AD-782035; KLD-TR-23; SAR-1) Avail: NTIS CSCL 20/4

The effects of the transverse component of velocity fluctuations on nominal stagnation point (NSP) pressure fluctuations are analyzed for a finite-thickness symmetric body penetrating into a turbulent flow. The analysis is idealized to the case of a two-dimensional symmetric airfoil-like profile. The results are given in analytical form. GRA

N74-33811# Illinois Inst. of Tech., Chicago. Dept. of Mechanics Mechanical and Aerospace Engineering.
MEASUREMENTS NEAR BLUFF BODIES IN TURBULENT BOUNDARY LAYERS INTENDED TO SIMULATE ATMOSPHERIC SURFACE LAYERS Interim Report
Jimmy Tan-Atichat and Hassan M. Nagib May 1974 185 p refs
(Contract F44620-69-C-0022; Grant NSF GK-41466; AF Proj. 7921)
(AD-782090; IIT-R74-2; AFOSR-74-0964TR) Avail: NTIS CSCL 14/2

A relatively new counter-jet technique is shown to be suitable for producing thick turbulent boundary layers which may be used to simulate neutral atmospheric surface layers in wind tunnels of moderate length. The increased thickness is achieved by providing large momentum defects at the wall through upstream-oriented, spanwise-discrete wall jets, with changeable jet velocities and controllable jet angles. This technique permits rapid alteration of reproducible boundary layers from outside the tunnel while the experiments are in progress. (Modified author abstract) GRA

N74-33812# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AIR, WATER, EARTH, AND FIRE
D. Pipko 24 Jun. 1974 13 p Transl. into ENGLISH from Sots. Industr. (USSR), no. 13, 16 Jan. 1972 p 4
(AD-782083; FTD-HT-23-2426-74) Avail: NTIS CSCL 20/4

Some notes are presented on Soviet research in the various subfields of fluid dynamics. GRA

N74-33813# Illinois Inst. of Tech., Chicago. Dept. of Mechanics Mechanical and Aerospace Engineering.
DIFFUSION FROM A PERIODICALLY HEATED LINE-SOURCE SEGMENT AND ITS APPLICATION TO MEASUREMENTS IN TURBULENT FLOWS Scientific Report
Roald A. Wigeland and Hassan M. Nagib May 1974 109 p refs

(Grant AF-AFOSR-2509-73; AF Proj. 9781)
(AD-782100; R74-3; AFOSR-74-1037TR) Avail: NTIS CSCL 20/4

A heat tracer technique for determination of mean streak lines and average convection velocities over long distances in turbulent flow fields is developed. The system is made up of a periodically heated line-source segment, a temperature sensing cold-wire probe, and associated signal processing equipment. Cross-correlations between the heating signal and the cold-wire output enhance resolution and permit mean velocity measurements. To evaluate the size of the thermal wake at different downstream locations and to determine the decay rate of the wake centerline temperature, a study of the diffusion of heat from the line-source segment was performed in three test flow conditions with different free-stream turbulence intensities. GRA

N74-33814# Illinois Univ., Urbana. Coordinated Science Lab.
TRANSIENT VISCOUS FLOW AROUND AN ELLIPTIC CYLINDER M.S. Thesis
Gary Arthur Roediger Jun. 1974 54 p refs
(Contract N00014-67-A-0305-0019)
(AD-782098; T-13; UILU-ENG-74-2216) Avail: NTIS CSCL 20/4

The paper presents a study of the transient flow of a compressible viscous gas around an elliptic cylinder which smoothly accelerates to a fixed velocity. The complete time-dependent Navier-Stokes equations are solved numerically in the body reference frame using a non-orthogonal time-dependent curvilinear coordinate system designed to describe the body exactly and to resolve the important features of the transient flow. The computation is performed in a fixed mesh which maps into a grid in physical space which evolves to accommodate the transient flow. Author (GRA)

N74-33815# Flow Research, Inc., Kent, Wash.
A COMPUTER PROGRAM FOR THREE-DIMENSIONAL LIFTING BODIES IN SUBSONIC INVISCID FLOW Final Report
F. A. Woodward, F. A. Dvorak, and E. W. Geller Apr. 1974 146 p refs
(Contract DAAJ02-73-C-0065; DA Proj. 1F1-62204-A-A41)
(AD-782202; Flow-Res-26; USAAMRDL-TR-74-18) Avail: NTIS CSCL 20/4

A computer program for the analysis of wing-body combinations in subsonic flow is described. The configuration is represented by a large number of surface panels. The circulation about lifting surfaces is provided by a system of vortex lattices. The strengths of the sources and vortices which satisfy the boundary condition of tangential flow for a given Mach number, angle of attack, and/or angle of yaw are determined by solving a system of linear equations by an iterative procedure. The program computes the pressure coefficients at the panel centroids and integrates these pressures numerically to obtain the lift, drag, and pitching moments. (Modified author abstract) GRA

N74-33816# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
THE FLOW ABOUT AND BEHIND THREE-DIMENSIONAL LIFTING SURFACES AND THE AERODYNAMIC NOISE PRODUCED IN COMPRESSIBLE SUBSONIC FLOWS Interim Scientific Report, 1 Jun. 1971 - 31 May 1973
Josef Rom 31 Jul. 1973 43 p refs
(Grant AF-AFOSR-2145-71; AF Proj. 9781)
(AD-782013; AFOSR-74-1047TR) Avail: NTIS CSCL 20/4

The work is proceeding along two separate paths which it is hoped eventually to amalgamate. One investigation consists of numerical work on the rolling up of the wing trailing vortex system when it is represented by discrete vortices according to a series of models of increasing complexity. The other is a detailed investigation of the flow field near wing tips and wake edges, including thickness effects. It is felt that the precise flow field near wing tips and the wake edges must be understood if the rolling up and structure of the trailing-vortex cores is to be properly studied. Author (GRA)

N74-33479* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTRODUCTION TO BOUNDARY-LAYER THEORY
William D. McNally *In its* Turbine Design and Appl., Vol. 2 1973 p 57-92 refs (For availability see N74-33476 23-03) CSCL 20D

N74-33480* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BOUNDARY-LAYER LOSSES
Herman W. Prust, Jr. *In its* Turbine Design and Appl., Vol. 2 1973 p 93-124 refs (For availability see N74-33476 23-03) CSCL 20D

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N74-33817*# Servicio Geologico de Bolivia, La Paz.
BOLIVIAN PARTICIPATION IN THE RESEARCH AND ANALYSIS OF EARTH RESOURCES EXPERIMENT (EREP)
Carlos E. Brockmann, Principal Investigator Mar. 1974 4 p Sponsored by NASA EREP
(E74-10727; NASA-CR-139573) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-33818*# Institut Francais du Petrole, Rueil-Malmaison.
TECTONICS RELATIONSHIPS BETWEEN PYRENEES AND ALPS (SOUTHERN FRANCE) Progress Report, Dec. 1973 - Jan. 1974
Jacques Guillemot, Principal Investigator Feb. 1974 7 p Sponsored by NASA EREP
(E74-10741; NASA-CR-139981) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-33819*# Institut Francais du Petrole, Rueil-Malmaison.
TECTONICS RELATIONSHIPS BETWEEN PYRENEES AND ALPS (SOUTHERN FRANCE) Progress Report, Feb. - Mar. 1974
Jacques Guillemot, Principal Investigator Apr. 1974 9 p Sponsored by NASA EREP
(E74-10742; NASA-CR-139982) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-33820*# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
A STUDY OF THE USEFULNESS OF SKYLAB EREP DATA FOR EARTH RESOURCES STUDIES IN AUSTRALIA Quarterly Progress Report, May - Jul. 1974
C. E. Maffi, C. J. Simpson, and W. J. Perry, Principal Investigators 15 Aug. 1974 6 p Sponsored by NASA EREP
(E74-10744; NASA-CR-139984) Avail: NTIS HC $4.00 CSCL 05B

The author has identified the following significant results. The stereo cover of the Skylab photos, their clarity, and their resolution put them far above the ERTS imagery not only in distinguishing between patterns but also in determining the nature of the country. The following land systems: (1) plains with sand dunes; (2) ridges, foothills, and alluvial plains; (3) dune-covered country with stony hills; and (4) alluvial plains were indistinguishable on the ERTS imagery. However, the same places are clearly distinguishable on the Skylab photos, together with the character of the dunes (parallel, reticulate, or irregular).

N74-33821*# Boeing Co., Kent, Wash.
QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Aug. 1974
David L. Tingey, Principal Investigator Aug. 1974 1 p EREP (Contract NAS9-13303)

(E74-10753; NASA-CR-139993) Avail: NTIS HC $4.00 CSCL 04A

There are no author-identified significant results in this report.

N74-33822*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Progress Report, 1 Jun. - 31 Jul. 1974
John W. Hannah, Principal Investigator (Brevard County Planning Dept., Titusville, Fla.), Garland L. Thomas (Brevard County Planning Dept., Titusville, Fla.), Fernando Esparza, and James J. Millard 31 Jul. 1974 23 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E74-10754; NASA-TM-X-70182) Avail: NTIS HC $4.25 CSCL 08B

There are no author-identified significant results in this report.

N74-33823*# Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.
SKYLAB IMAGERY OF CENTRAL AMERICAN VOLCANOES Progress Report, Feb. - Apr. 1974
Richard E. Stoiber, Principal Investigator and William I. Rose, Jr. (Michigan Technological Univ.) Aug. 1974 4 p EREP
(Contract NAS9-13311)
(E74-10755; NASA-CR-139995) Avail: NTIS HC $4.00 CSCL 08F

The author has identified the following significant results. The size and intensity of the Izalco volcano thermal anomaly, which were increasing between July and December 1973, have not increased in the January-April 1974 period. Volcanic activity at Pacaya volcano, Guatemala was very prominent during the quarter. Details of the activity are being collected and assembled.

N74-33824*# Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.
SKYLAB IMAGERY OF CENTRAL AMERICAN VOLCANOES Progress Report, May - Jul. 1974
Richard E. Stoiber, Principal Investigator and William I. Rose, Jr. (Michigan Technological Univ.) Sep. 1974 4 p EREP
(Contract NAS9-13311)
(E74-10756; NASA-CR-139996) Avail: NTIS HC $4.00 CSCL 08F

There are no author-identified significant results in this report.

N74-33825*# Geological Survey, Reston, Va.
SELECTED APPLICATIONS OF SKYLAB HIGH-RESOLUTION PHOTOGRAPHY TO URBAN AREA LAND USE ANALYSIS Interim Report
Robert H. Alexander, Principal Investigator and Harry F. Lins, Jr. 15 Aug. 1974 39 p Original contains color illustrations. Original contains color imagery. Orginal photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(NASA Order T-5290-B)
(E74-10757; NASA-CR-139997) Avail: NTIS HC $5.00 CSCL 14E

There are no author-identified significant results in this report.

N74-33826*# Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES Progress Report, 1 Aug. - 31 Aug. 1974
Ernest E. Hardy, Principal Investigator 31 Aug. 1974 2 p EREP
(Contract NAS9-13364)
(E74-10759; NASA-CR-139999) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-33827*# Imperial Government of Iran, Tehran.
AN EVALUATION OF THE UTILITY OF ERTS-1 DATA FOR MAPPING AND DEVELOPING NATURAL RESOURCES OF IRAN Interim Report, Jan. - Jun. 1973
K. Ebtehadj, Principal Investigator Jul. 1973 71 p refs Sponsored by NASA Original contains color illustrations. Original contains color imagery. Orginal photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E74-10760; NASA-CR-140000) Avail: NTIS HC $6.75 CSCL 08F

The author has identified the following significant results. Significant results are reported in the creation of an Iranian photomosaic from ERTS-1 imagery; in tectonic and structural mapping and interpretation, including discovery of significant new fault patterns in Iran; in river and lake mapping; in wetlands and fisheries nursery delineation and mapping; in range and agricultural surveys and inventories using multi-stage sample methods; and in the computer analysis of ERTS-1 digital tapes for urban land use.

N74-33828*# Imperial Government of Iran, Tehran.
APPLICATION OF ERTS-1 IMAGERY IN THE FIELDS OF GEOLOGY, AGRICULTURE, FORESTRY, AND HYDROLOGY TO SELECTED TEST SITES IN IRAN Quarterly Progress Report, Oct. 1972 - Jan. 1973
Khosro Ebtehadj, Principal Investigator Jan. 1973 23 p refs Sponsored by NASA ERTS
(E74-10761; NASA-CR-140001) Avail: NTIS HC $4.25 CSCL 08F

There are no author-identified significant results in this report.

N74-33829*# Wyoming Univ., Laramie. Dept. of Geology.
MULTIDISCIPLINARY STUDY OF WYOMING TEST SITES Progress Report, Apr. - Aug. 1974
Ronald W. Marrs, Principal Investigator 1 Sep. 1974 22 p refs EREP
(Contract NAS9-13298)
(E74-10762; NASA-CR-140002; PR-4) Avail: NTIS HC $4.25 CSCL 08F

There are no author-identified significant results in this report.

N74-33830*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Quarterly Progress Report, 1 May - 31 Jul. 1974
John W. Hannah, Principal Investigator (Brevard County Planning Dept., Titusville, Fla.), Garland L. Thomas (Brevard County Planning Dept., Titusville, Fla.), Fernando Esparza, and Homer Royals (Florida Game and Fresh Water Fish Comm., Eustis) 1 Aug. 1974 12 p EREP
(E74-10763; NASA-TM-X-70355) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-33831*# Science Applications, Inc., Ann Arbor, Mich.

USE OF SKYLAB EREP DATA IN A SEA SURFACE TEMPERATURE EXPERIMENT Quarterly Report
David C. Anding, Principal Investigator and John P. Walker Sep. 1974 9 p EREP
(Contract NAS9-13277)
(E74-10764; NASA-CR-140004; JRB-74-202-AA) Avail: NTIS HC $4.00 CSCL 08J

There are no author-identified significant results in this report.

N74-33832*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1 Aug. - 31 Aug. 1974
A. G. Mourad, D. M. J. Fubara, Principal Investigators, and M. B. Kuhner 20 Sep. 1974 3 p EREP
(Contract NAS9-13276)
(E74-10765; NASA-CR-140005; PR-18) Avail: NTIS

HC $4.00 CSCL 08E
There are no author-identified significant results in this report.

N74-33833*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
EVALUATION OF SKYLAB DATA FOR LAND USE MAPPING Progress Report, Aug. 1974
LeRoy Silva, Principal Investigator Aug. 1974 1 p EREP
(Contract NAS9-13301)
(E74-10766; NASA-CR-140006) Avail: NTIS HC $4.00 CSCL 08B
There are no author-identified significant results in this report.

N74-33834*# Servicio Geologico de Bolivia, La Paz.
BOLIVIAN PARTICIPATION IN THE INVESTIGATION AND ANALYSIS OF EARTH RESOURCES EXPERIMENT (EREP)
Carlos E. Brockmann, Principal Investigator Sep. 1973 4 p
Sponsored by NASA EREP
(E74-10767; NASA-CR-140015) Avail: NTIS HC $4.00 CSCL 05B
There are no author-identified significant results in this report.

N74-33835*# Lockheed Missiles and Space Co., Palo Alto, Calif. Space Sciences Lab.
INVESTIGATION OF IONOSPHERE AND AIRGLOW RESPONSE TO CUSP ELECTRONS Final Report
William C. Knudsen 16 Aug. 1974 3 p
(Contract NASw-2550)
(NASA-CR-140427; LMSC-D403994) Avail: NTIS HC $4.00 CSCL 04A
The objectives are presented to compare and compute ionospheric quantities and airglow emission. M.C.F.

N74-33836*# Mitre Corp., McLean, Va.
AN AIRBORNE REMOTE SENSING SYSTEM FOR URBAN AIR QUALITY
L. J. Duncan, E. J. Friedman, E. L. Keitz, and E. A. Ward Feb. 1974 279 p refs Sponsored by NASA
(Contract F19628-73-C-001; Proj. 8190)
(NASA-CR-132499; MTR-6601) Avail: NTIS HC $6.75 CSCL 13B
Several NASA sponsored remote sensors and possible airborne platforms were evaluated. Outputs of dispersion models for SO2 and CO pollution in the Washington, D.C. area were used with ground station data to establish the expected performance and limitations of the remote sensors. Aircraft/sensor support requirements are discussed. A method of optimum flight plan determination was made. Cost trade offs were performed. Conclusions about the implementation of various instrument packages as parts of a comprehensive air quality monitoring system in Washington are presented. Author

N74-33837*# National Aeronautics and Space Administration, Washington, D.C.
TECHNICAL FUNDAMENTALS OF AEROELECTRICAL EXPLORATION
V. N. Goncharskiy, N. I. Kalashnikov, and S. K. Kuzovkin Washington NASA Feb. 1974 772 p refs Transl. into ENGLISH of the book "Tekhnicheskiye Osnovy Aeroelektrorazvedki" Kiev, Naukova Dumka Press, 1969 p 1-380
(NASA-TT-F-15402) Avail: NTIS HC $41.75 CSCL 08G
Development in methods and apparatus for geophysical serial electric prospecting of useful minerals is reported. Estimates of primary electromagnetic fields are given, along with an analysis of electromagnetic interference from various origins which affect the receiving/measuring channel of the equipment. Electric compensation methods are also discussed for the primary field signal. Author

N74-33838# Ionospharen-Institut Breisach (West Germany).
IONOSPHERIC DATA: VERTICAL ECHO SOUNDING, FREIBURG, FEBRUARY 1974 [IONOSPHAEREN-DATEN: VERTIKAL-ECHO-LOTUNG, FREIBURG, FEBRUAR 1974]
Feb. 1974 44 p In ENGLISH and GERMAN
(Rept-332F) Avail: NTIS HC $5.25
Daily summaries are presented for vertical echo sounding of the upper atmosphere during February 1974. The data include charts of median values for the E and F regions. Author

N74-33839# Joint Publications Research Service, Arlington, Va.
USE OF ARTIFICIAL EARTH SATELLITES FOR MEASURING WAVES
A. A. Zagorodnikov 16 Sep. 1974 17 p refs Transl. into ENGLISH from Izv. Akad. SSSR, Fiz. Atmosfery i Okeana (Moscow), v. 10, no. 7, 1974 p 791-798
(JPRS-62980) Avail: NTIS HC $4.00
A proposal is presented for the use of radio-thermal emission from the sea to measure sea waves. Author

N74-33840*# Virginia Univ., Charlottesville.
ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE MANAGEMENT Final Report
H. G. Goodell, C. M. Woolheater, and K. L. Echternacht Sep. 1972 139 p refs
(Contracts NASA Order W-13165; DI-14-08-001-12540)
(NASA-CR-139994; PB-214547; USGS-IR-NASA-243; USGS-DO-73-005) Avail: NTIS HC $10.00 CSCL 08A
The Richmond-Cape Henry Environmental Laboratory (RICHEL) in southeastern Virginia is composed of 17 counties, 14 independent cities, and 21 incorporated towns arranged into 4 planning districts, and is the site chosen for an environmental model for the testing of coastal zone land use and marine resource management. The conceptual base and the geographic parameters used to describe the model are reviewed, and the environmental impacts of land use are assessed, including RICHEL population densities and trends, hydrology and erosion, power consumption, and water effluents from industrial, municipal, and agricultural sources. An environmental computer model is proposed for RICHEL which was devleoped around the hydrologic cycle and includes 2 major data banks consisting of climate and land use. The computer model quantifies the impacts of population on the RICHEL environment in terms of human activities which result in interference with the hydrologic cycle, accelerated erosion, and effluent generation. A.A.D.

N74-33841*# Virginia Univ., Charlottesville.
ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE MANAGEMENT, APPENDICES A TO E
Sep. 1972 202 p refs
(NASA Order W-13165; Contract USGS-14-08-001-12540)
(NASA-CR-140392; USGS-IR-NASA-243-App-A-B-C-D-E) Avail: NTIS HC $13.25 CSCL 08A
Important data were compiled for use with the Richmond-Cape Henry Environmental Laboratory (RICHEL) remote sensing project in coastal zone land use and marine resources management, and include RICHEL climatological data and sources, a land use inventory, topographic and soil maps, and gaging records for RICHEL surface waters. A.A.D.

N74-33842*# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE MANAGEMENT. APPENDIX F: USER'S GUIDE FOR ADVECTION, CONVECTION PROTOTYPE
Sep. 1972 140 p
(NASA Order W-13165; Contract USGS-14-08-001-12540)
(NASA-CR-140037; USGS-IR-NASA-243-App-F) Avail: NTIS HC $10.00 CSCL 08A
A user's manual is provided for the environmental computer model proposed for the Richmond-Cape Henry Environmental Laboratory (RICHEL) application project for coastal zone land use investigations and marine resources management. The model was developed around the hydrologic cycle and includes two data bases consisting of climate and land use variables. The main program is described, along with control parameters to be set and pertinent subroutines. A.A.D.

N74-33843*# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
ENVIRONMENTAL APPLICATION OF REMOTE SENSING

METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE MANAGEMENT, APPENDICES G TO J
Sep. 1972 140 p
(NASA Order W-13165; Contract USGS-14-08-001-12540)
(NASA-CR-140036; USGS-IR-NASA-243-App-G-H-I-J) Avail: NTIS HC $10.00 CSCL 08A

Important data were compiled for use with the Richmond-Cape Henry Environmental Laboratory (RICHEL) remote sensing project in coastal zone land use and marine resources management, and include analyses and projections of population characteristics, formulation of soil loss prediction techniques, and sources and quantity analyses of air and water effluents. A.A.D.

N74-33844# Ionospharen-Institut Breisach (West Germany).
ABSORPTIONS DATA: FREIBURG, URSI-CODE 131, APRIL - JUNE 1973 [ABSORPTIONS-DATEN: FREIBURG, URSI-CODE 131, APRIL - JUNI 1973]
Jun. 1973 89 p
Avail: NTIS HC $7.50

Daily summaries are presented for vertical sounding of the upper atmosphere. The data include charts of median values for the E and F regions. The application of the digisonde to obtain ionospheric absorptions using echo amplitude is discussed. Author

N74-33845# Ionospharen-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING: FREIBURG, URSI-CODE 131 JUNE 1974 [IONOSPHAEREN-DATEN, VERTIKAL-ECHO-LOTUNG: FREIBURG, URSI-CODE 131]
Jun. 1974 42 p In GERMAN and ENGLISH
(Rept-336-F) Avail: NTIS HC $5.25

Daily summaries are presented for vertical echo sounding of the upper atmosphere during June 1974. The data include charts of median values for the E and F regions. Author

N74-33846# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON MAPPING AND TOPOGRAPHIC MEASUREMENTS. SERIES 1: ORIGINAL CONTRIBUTIONS, ISSUE NO. 61 [NACHRICHTEN AUS DEM KARTEN UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE, HEFT NR. 61]
1973 75 p refs In GERMAN; ENGLISH summary
Avail: NTIS HC $6.75

Computer techniques for contour analysis and relief mapping are discussed. For individual titles, see N74-33847 through N74-33853.

N74-33847 Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
STUDIES ON THE APPLICATION OF CONTOUR FREQUENCIES OF SPECTRAL FUNCTIONS FOR GENERALIZED SMOOTHING OF MEASUREMENT DATA [UNTERSUCHUNGEN UEBER DIE VERWENDUNG VON GRENZFREQUENZEN VON SPEKTRALFUNKTIONEN FUER EINE GENERALISIERUNGSMASSZAHL]
Rolf Gerlach *In its* Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 5-17 refs In GERMAN; ENGLISH summary (For availability see N74-33846 23-13)

A numerical examination considers to which extend the sampling distance of a digitized contour line is changed when smoothed by means of a gliding arithmetic mean. Author

N74-33848 Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AUTOMATIC DEDUCTION OF A BUILDING AREA IN 1:200 000 SCALE FROM 1:50 000 DIGITAL SCALED AREAS AND SINGLE BUILDINGS [DIE AUTOMATISCHE ABLEITUNG EINER SIEDLUNGSDARSTELLUNG IM MASSSTAB 1:200 000 AUS IM MASSSTAB 1:50 000 DIGITALISIERTEN FLAECHEN UND EINZELHAEUSERN]
Hans-Joerg Gottschalk *In its* Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 19-29 ref In GERMAN; ENGLISH summary (For availability see N74-33846 23-13)

Single houses, center areas and big area buildings are digitized in a 1:50,000 scale topographical map. A representation of settlements in the 1:200,000 scale is automatically derived from the digitized data. Author

N74-33849 Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
EXPERIENCES FROM THE TEST APPLICATION OF THE GRADICON DIGITALIZER TO MAPPING [ERFAHRUNGEN BEIM TESTEINSATZ DES DIGITALISIERGERAETES GRADICON IN DER KARTOGRAPHIE]
R. Harbeck *In its* Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 31-40 In GERMAN; ENGLISH summary (For availability see N74-33846 23-13)

The Gradicon digitizer, which is working with an electronic-mechanical measuring slide system, has been tested concerning its applicability to cartography. The quality of this instrument has been checked mainly with regard to functional reliability, manipulability, capacity and precision. It is shown that this instrument fully corresponds with the mechanical and electronic digitizers that operate in the range of resolution of about 0.01 mm. Author

N74-33850 Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
EFFECTS OF HYSTERESIS AND OF INTERNAL TRANSFORMATION OF INCHES INTO METERS FOR THE ARISTOGRID DIGITIZER [EINFLUESSE DER HYSTERESE UND DER INTERNEN UMWANDLUNG VON ZOLL IN METER BEIM ARISTOGRID-DIGITIZER] c08
Theodor Johannsen *In its* Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 41-49 refs In GERMAN; ENGLISH summary (For availability see N74-33846 23-13)

During an inversion of the digitizing direction, the hysteresis (inversion effect) appearing with an analog digital conversion causes a displacement of the jump point between two neighboring digital units. The possibility, inherent in the digitizer, of converting the coordinates measured in inches into metric values causes jumps in the metric indicator by different groups of the metric unit of 0.01 mm, i.e. by 0.02 mm, 0.03 mm, or 0.04 mm. The effects of these influences on the measuring accuracy are described. Author

N74-33851 Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DEVELOPMENT OF A RASTERPLOTTER BY PRAKLA-SEISMOS G.m.b.H. [ENTWICKLUNG EINES RASTERPLOTTERS VON DER PRAKLA-SEISMOS G.M.B.H.]
Guenter Meinicke *In its* Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 51-60 In GERMAN; ENGLISH summary (For availability see N74-33846 23-13)

Graphic representation every month of hundreds of thousands of seismic traces obtained in mineral deposit research required the development of a special apparatus, the so-called profilograph, for these tasks. The steady improvement of the profilographs finally led to a redevelopment of the Digital Universal Plotter (KPU) by the end of 1971. The KPU consists of three parts: a nine track magnetic tape drive for data input, a control computer, and a photo exposure device in which a film fastened on a rotation drum of 1250 mm in size is exposed point by point in 16 shades of gray (which can be freely selected from a scale of maximally 256 shades of gray) by an oscillating cathode ray, the intensity of which can be increased or reduced. The speed of the KPU is so high that the drawing area of 1 sq m can be plotted in five minutes, the resolution is 0.05, 0.1 or 0.2 mm at choice, and the accuracy is 5 micron throughout. Author

N74-33852 Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ON THE COLLECTION OF CARTOGRAPHIC DATA [ZUR ERFASSUNG KARTOGRAPHISCHER DATEN]
G. Mittelstrass *In its* Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 61-63 In GERMAN; ENGLISH summary (For availability see N74-33846 23-13)

The structures of cartographic data are considered for a combination in computers. The map elements are subdivided into local elements and large area elements which have to be collected and recorded separately. For the map representation, the large area elements will have a certain influence (constraint)

on local elements. This system can also be realized with relatively small computers. Author

N74-33853 Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE PICTURE PROCESSING SYSTEM GRAFIX 1 [DAS BILDVERARBEITUNGSSYSTEM GRAFIX 1] c14
Klaus Woelcken *In its* Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 65-74 refs In GERMAN; ENGLISH summary (For availability see N74-33846 23-13)

First tests with the programmable film reading instrument GRAFIX 1 are reported. An introduction is given to the major components of the system. Sections of a map containing contour lines and an aerial photograph have been digitized. The latter has been used for testing basic properties of the systems image processor. Author

N74-33854*# Ohio State Univ. Research Foundation, Columbus. Dept. of Geodetic Science.
PROCEDURES AND RESULTS RELATED TO THE DIRECT DETERMINATION OF GRAVITY ANOMALIES FROM SATELLITE AND TERRESTRIAL GRAVITY DATA
Richard H. Rapp Jul. 1974 56 p refs
(Grant NGR-36-008-161; OSURF Proj. 3210)
(NASA-CR-140064; Rept-211) Avail: NTIS HC $6.00 CSCL 08N

The equations needed for the incorporation of gravity anomalies as unknown parameters in an orbit determination program are described. These equations were implemented in the Geodyn computer program which was used to process optical satellite observations. The arc dependent parameter unknowns, 184 unknown 15 deg and coordinates of 7 tracking stations were considered. Up to 39 arcs (5 to 7 days) involving 10 different satellites, were processed. An anomaly solution from the satellite data and a combination solution with 15 deg terrestrial anomalies were made. The limited data samples indicate that the method works. The 15 deg anomalies from various solutions and the potential coefficients implied by the different solutions are reported. Author

N74-33855*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DATA FOR NASA'S AVE 2 PILOT EXPERIMENT. PART 1: 25-mb SOUNDING DATA AND SYNOPTIC CHARTS
James R. Scoggins (Tex. A and M Univ.) and Robert E. Turner Sep. 1974 535 p refs
(NASA-TM-X-64877) Avail: NTIS HC $29.75 CSCL 04A

Tabulated rawinsonde data at 25-mb intervals from surface to 25 mb is presented for the 54 stations participating in the Atmospheric Variability Experiment 11 pilot experiment which began at 12 GMT on May 11, 1974, and ended at 12 GMT on May 12, 1974. Soundings were made at 3 hour intervals. A brief discussion is included on methods of processing and data accuracy, and synoptic charts prepared from the the data are presented. The area covered by the sounding stations is the eastern United States, east of approximately 105 deg west longitude. Author

N74-33856*# California Univ., Los Angeles. Dept. of Planetary and Space Science.
ERROR ANALYSIS FOR STATION POSITION FROM TRACKING OF THE LAGEOS SATELLITE
Mary E. Parmenter and William M. Kaula Aug. 1974 29 p refs
(Contract NsG-7002)
(NASA-CR-140118) Avail: NTIS HC $4.50 CSCL 08E

The earth physics satellite systems error analysis program was applied to the problem of predicting the relative accuracy of station position determinations under varying orbital and observing geometries. The reference case consists of nine ground stations extending over 1500 km which lasers ranged to a LAGEOS satellite, with simultaneous Doppler tracking from a geosynchronous satellite for 16 days. Eleven variations from the reference case were tested. The results showed little sensitivity to whether the LAGEOS altitude is 3700 or 5690 km. More significant were the high inclination, and that LAGEOS was tracked by a geosynchronous satellite. Author

N74-33857*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
REMOTE SENSING IN MICHIGAN FOR LAND RESOURCE MANAGEMENT Annual Report, 1 Jun. 1973 - 31 May 1974
D. S. Lowe, L. B. Istvan, N. E. Roller, I. J. Sattinger, A. N. Sellman, and T. W. Wagner Sep. 1974 58 p refs
(Grant NGR-23-005-552)
(NASA-CR-140115; ERIM-193400-5-P) Avail: NTIS HC $6.00 CSCL 08B

The application of NASA earth resource survey technology to resource management and environmental protection in Michigan was investigated. Remote sensing techniques to aid Michigan government agencies were applied in the following activities: (1) land use inventory and management, (2) great lakes shorelands protection and management, (3) wetlands protection and management, and (4) soil survey. In addition, information was disseminated on remote sensing technology, and advice and assistance was provided to a number of users. Author

N74-33858*# Kanner (Leo) Associates, Redwood City, Calif.
WASTE-PRODUCT POLLUTION OF BODIES OF WATER AND WASTE-WATER PURIFICATION
P. E. M. Schneider Washington NASA Sep. 1974 33 p refs Transl. into ENGLISH of "Zur Abfallstoffbelastung von Gewaessern und zur Abwasserreinigung" Goettingen, Max-Planck-Inst. fuer Stroemungsforschung, report 2/1974 53 p
(Contract NASw-2481)
(NASA-TT-F-15934; Rept-2/1974) Avail: NTIS HC $4.75 CSCL 06I

A literature survey is presented on problems of water pollution and self-reclamation methods. It is shown that current flow plays an important role in the turbulent transfer of surface oxygen into deeper water layers and thus to natural waste conversion by living organisms. The amount of oxygen available to living organisms in deep water is strictly dependent on current patterns. Author

N74-33859*# Scientific Translation Service, Santa Barbara, Calif.
RESPIRATION OF THE SOIL AFTER ADDITION OF GLUCOSE AND INORGANIC NITROGEN
B. Novak Washington NASA Sep. 1974 11 p refs Transl. into ENGLISH from Zentralbl. Bakteriol. (East Germany), v. 125, no. 1, 1970 p 71-76
(Contract NASw-2483)
(NASA-TT-F-15917) Avail: NTIS HC $4.00 CSCL 08M

The effect of increasing additions of glucose (10 mg % to 1,000 mg %) and of ammonium sulfate (10 mg % to 50 mg %) to production after 20 hours incubation was measured to test the respiratory activity. Also respiration and substrate mineralization increased with increasing concentrations of glucose and nitrogen in soil. The percentage mineralization of the added substrate increased with increasing N concentration and decreased with increasing C concentration. Author

N74-33860*# Scientific Translation Service, Santa Barbara, Calif.
MICROBIOLOGICAL TRANSFORMATIONS OF PHOSPHOROUS IN VOLCANIC SOILS OF THE PURACE AREA
Mario L. Blasco, Nhora A. Bohorquez, and Carmen M. Llanos Washington NASA Sep. 1974 11 p refs Transl. into ENGLISH of "Transformaciones Microbiologicas del Fosforo en los Suelos Volcanicos del Purace", Acta Agron. (South America), v. 18, 1968 p 1-6
(Contract NASw-2483)
(NASA-TT-F-15929) Avail: NTIS HC $4.00 CSCL 08M

Immobilization is shown to be the predominant process in the volcanic soils of Purace in spite of an organic ratio lower than 200. In these volcanic, the organic ratio appears to be an unreliable index for predicting organic P mineralization. Author

N74-33861*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CORN BLIGHT WATCH EXPERIMENT Summary Report
Washington 1974 17 p Original contains color illustrations
(NASA-SP-353) Avail: NTIS MF $1.45; SOD HC $0.55 CSCL 02C

The corn blight problem is briefly described how the experiment was organized and conducted, the effect of the blight

on the 1971 crop, and some conclusions that may be drawn as a result of the experiment. The information is based on preliminary reports of the Corn Blight Watch Steering Committee and incorporates much illustrative material conceived at Purdue University. Author

N74-33862# Weapons Research Establishment, Salisbury (Australia).
DROPSONDE TEMPERATURE RESULTS WOOMERA, SOUTH AUSTRALIA 1970, 1971 AND 1972
A. D. Hind Aug. 1973 26 p refs
(WRE-TN-988(WR/D)) Avail: NTIS HC $4.50

A dropsonde is an expendable instrumented package released from a low cost rocket to obtain vertical profiles of temperature, ozone, and winds in the upper atmosphere. The temperature results obtained during 1970, 1971 and 1972 are reported. Author

N74-33863*# Illinois Univ., Urbana. Dept. of Electrical Engineering.
INVESTIGATIONS OF THE IONOSPHERE BY SPACE TECHNIQUES
S. A. Bowhill [1974] 18 p refs
(Grant NGR-07-004-109)
(NASA-CR-140039) Avail: NTIS HC $4.00 CSCL 04A

Much of the impetus to ionosphere research since the International Geophysical Year has come from new types of measurement using space vehicles. The key developments are outlined, together with the contributions that they have made to the understanding of the ionosphere. Author

N74-33864*# Illinois Univ., Urbana. Dept. of Electrical Engineering.
CALCULATED PHOTOELECTRON PITCH ANGLE AND ENERGY SPECTRA
G. P. Mantas and S. A. Bowhill [1974] 49 p refs
(Grant NGR-07-004-109)
(NASA-CR-140040) Avail: NTIS HC $5.50 CSCL 04A

Calculations of the steady-state photoelectron energy and angular distribution in the altitude region between 120 and 1000 km are presented. The distribution is found to be isotropic at all altitudes below 250 km, while above this altitude anisotropies in both pitch angle and energy are found. The isotropy found in the angular distribution below 250 km implies that photoelectron transport below 250 km is insignificant, while the angular anisotropy found above this altitude implies a net photoelectron current in the upward direction. The energy anisotropy above 500 km arises from the selective backscattering of the low energy photoelectron population of the upward flux component by Coulomb collisions with the ambient ions. The total photoelectron flux attains its maximum value between about 40 and 70 km above the altitude at which the photoelectron production rate is maximum. The displacement of the maximum of the equilibrium flux is attributed to an increasing (with altitude) photoelectron lifetime. Photoelectrons at altitudes above that where the flux is maximum are on the average more energetic than those below that altitude. Author

N74-33865*# Andros, Inc., Berkeley, Calif.
THE CONTINUOUS MEASUREMENT OF HYDROGEN CHLORIDE IN THE AMBIENT ATMOSPHERE USING THE DUAL ISOTOPE INFRARED ABSORPTION TECHNIQUE
Kevin G. Williams Feb. 1974 31 p
(Contract NAS1-12404)
(NASA-CR-132520; ARFR-66) Avail: NTIS HC $3.25 CSCL 04A

The results of a program to develop a prototype gas filter correlation NDIR analyzer capable of providing the required HCl measurement capability, while maintaining an adequate rejection of any other gases anticipated in the atmosphere are presented. Examples of the performance of the prototype analyzer are presented which show an rms noise equivalent concentration of 0.06 ppm of HCl was achieved while maintaining an electronically determined 10% to 90% time response to gas samples of about 2 seconds. No measureable response was observed to CO2, CO, and H2O while maintaining an adequate rejection of the hydrocarbons, for example CH4 and n-hexane. The experiments were performed which demonstrate that the span stability of the HCl gas filter correlation analyzer is unaffected by the presence of water vapor and which support the belief that the incorporation of a relatively open-volume, multiple path sample cell into the instrument would enable ground station as well as airborne measurements of trace quantities of HCl in the ambient atmosphere to be performed. Author

N74-33866# Committee on Public Works (U. S. Senate).
THE ECONOMICS OF CLEAN WATER, 1973 Annual Report of the Administrator of the Environmental Protection Agency to the Congress of the United States
Washington GPO 1974 128 p refs Presented to the Comm. on Public Works, 93d Congr., 2d Sess., Jan. 1974 Prepared by the Environ. Protection Agency
(GPO-27-806) Avail: SOD HC $1.40

The nature and trends in water pollution are reviewed in the sixth in a series of clean water reports to Congress, and the minicipal and industrial costs associated with controlling certain pollutants and pollution sources are tabulated and discussed. The status of public sewerage services is described, along with industrial efforts to curb nonthermal pollution. The capacity of U. S. agriculture to meet food and fiber demand to the year 2000 under the environmental restrictions on soil loss and use of nitrogen fertilizers is also assessed. The 1977 standards set by the Federal Water Pollution Control Act Amendments of 1972 are considered in the cost and impact analysis, and potential problems foreseen in meeting the deadline are discussed. A.A.D.

N74-33867# Joint Publications Research Service, Arlington, Va.
GEOPHYSICAL EQUIPMENT
9 Sep. 1974 36 p refs Transl. into ENGLISH from the book "Geofizicheskaya Apparatura" Leningrad, Izd. Nedra, 1973 p 3-30
(JPRS-62915) Avail: NTIS HC $5.00

Aspects of equipment and methods of magnetometry are reported, as reflected by U.S.S.R. research on the measurement of terrestrial magnetism. For individual titles, see N74-33868 through N74-33871.

N74-33868 Joint Publications Research Service, Arlington, Va.
PHENOMENON OF INTERSECTION OF ATOMIC MAGNETIC SUBLEVELS IN THE GROUND STATE AND ITS APPLICATION IN MAGNETOMETRY
G. V. Skrotskiy and G. I. Solomakho *In its* Geophys. Equipment (JPRS-62915) 9 Sep. 1974 p 1-15 refs Transl. into ENGLISH from the book "Geofizicheskaya Apparatura" Leningrad, Izd. Nedra, 1973 p 3-15 (For availability see N74-33867 23-13)

The measurement of very weak magnetic fields, with intensities of 10 to the minus 5th power oersteds and less, was investigated in a model system in which the atoms, both in the ground state and the excited state, have two Zeeman sublevels. The intersection of sublevels in a modulated field was considered, along with external field compensation by using the Hanly effect in the ground state. It was found that the sensitivity of magnetometers, based on the effect of intersection of the sublevels in the ground state of atoms, does not reach the theoretically possible limiting value of 10 to the minus 11th power, chiefly because of a low signal to noise ratio, and because of systematic errors which displace the center of the resonance line from the point corresponding to the zero value of the measured field. The described methods and instruments are suited, however, to measuring the static or slowly varying magnetic fields in which the spins follow the field. A.A.D.

N74-33869 Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF THE PARAMETERS OF CESIUM AND RUBIDIUM ABSORPTION CELLS
V. B. Goryashchenko and V. S. Korol *In its* Geophys. Equipment (JPRS-62915) 9 Sep. 1974 p 16-23 refs Transl. into ENGLISH from the book "Geofizicheskaya Apparatura" Leningrad, Izd. Nedra, 1973 p 16-23 (For availability see N74-33867 23-13)

The variation of the S sub z-signal intensity, and the halfwidth of the radio-optical resonance line as a function of temperature and the artificially created nonuniformity of the magnetic field, were studied using cesium and rubidium absorption cells of different sizes. It was concluded that a decrease in the absorption

cell length leads to an increase in the optimal thermostatting temperature, that with a decrease in the absorption cell size, the effect of the field nonuniformity on the signal parameters decreases sharply, and that there are regions of variation of the gradient in which the gradient has no effect on the radio-optical resonance signal parameters. A.A.D.

N74-33870 Joint Publications Research Service, Arlington, Va.
NOISE COMPENSATION IN THE BODY OF THE COMPONENT MAGNETOMETER SENSORS c14
E. Ye. Reznik *In its* Geophys. Equipment (JPRS-62915) 9 Sep. 1974 p 24-28 refs Transl. into ENGLISH from the book "Geofizicheskaya Apparatura" Leningrad, Izd. Nedra, 1973 p 23-27 (For availability see N74-33867 23-13)

Experimental studies were performed on two constant noise compensators for component magnetometer sensors to determine errors caused by magnetic fields generated by the magnetometer carrier. Methods for measuring and compensating for the noise using Poisson coefficients are reviewed for constant interference, inductive interference, and interference from eddy currents. A.A.D.

N74-33871 Joint Publications Research Service, Arlington, Va.
INCREASING THE NOISE PROOFNESS OF A NUCLEAR PRECESSION MAGNETOMETERS c14
B. I. Bashchenko and V. I. Myukhkyurya *In its* Geophys. Equipment (JPRS-62915) 9 Sep. 1974 p 29-33 refs Transl. into ENGLISH from the book "Geofizicheskaya Apparatura" Leningrad, Izd. Nedra, 1973 p 27-30 (For availability see N74-33867 23-13)

The attenuation effect of external electromagnetic interference penetrating into the amplifying channel of a nuclear precession magnetometer was examined. A simple scheme is proposed for modification of the input curcuit of the magnetometer amplifier using shielded connecting cables and an electrostatic shield in the form of a grid of insulated conductors. A.A.D.

N74-33872*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ARGON: A THERMOMETER OF THE UPPER ATMOSPHERE
S. Chandra and N. W. Spencer Aug. 1974 21 p refs Submitted for publication
(NASA-TM-X-70754; X-621-74-254) Avail: NTIS HC $4.25 CSCL 04A

The exospheric temperatures are derived from Ar, N2, O and He measurements obtained from the Aeros-1 NATE experiment. It is shown that the temperatures derived from Ar and N2 are very close to each other and show very similar seasonal, latitudinal and the day to night variations both under quiet and the geomagnetically disturbed conditions. The temperatures derived from O and He do not usually follow this pattern because of their large variabilities in the lower thermosphere. The differences in the inferred temperatures from these gases are particularly noticeable when the neutral composition data between 220-250 km are used. In this altitude region Ar appears to have some advantage over N2 for the purpose of deriving neutral temperature. Author

N74-33873*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THIRD EARTH RESOURCES TECHNOLOGY SATELLITE SYMPOSIUM. VOLUME 3: DISCIPLINE SUMMARY REPORTS
Stanley C. Freden, comp., Enrico P. Mercanti, comp., and David B. Friedman, comp. Washington May 1974 159 p refs Presented at the 3rd Symp. on Significant Results Obtained from the 1st Earth Resources Technol. Satellite, Washington, D. C., 10-14 Dec. 1973; Sponsored by NASA
(NASA-SP-357) Avail: NTIS MF $2.25; SOD HC $2.30 CSCL 05B

Presentations at the conference covered the following disciplines: (1) agriculture, forestry, and range resources; (2) land use and mapping; (3) mineral resources, geological structure, and landform surveys; (4) water resources; (5) marine resources; (6) environment surveys; and (7) interpretation techniques. For individual titles, see N74-33874 through N74-33880.

N74-33874* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AGRICULTURE, FORESTRY, RANGE RESOURCES
William J. Crea *In its* 3rd ERTS Symp., Vol. 3 May 1974 p 1-14 refs (For availability see N74-33873 23-13)
CSCL 08F

In the area of crop specie identification, it has been found that temporal data analysis, preliminary stratification, and unequal probability analysis were several of the factors that contributed to high identification accuracies. Single data set accuracies on fields of greater than 80,000 sq m (20 acres) are in the 70- to 90-percent range; however, with the use of temporal data, accuracies of 95 percent have been reported. Identification accuracy drops off significantly on areas of less than 80,000 sq m (20 acres) as does measurement accuracy. Forest stratification into coniferous and deciduous areas has been accomplished to a 90- to 95-percent accuracy level. Using multistage sampling techniques, the timber volume of a national forest district has been estimated to a confidence level and standard deviation acceptable to the Forest Service at a very favorable cost-benefit time ratio. Range specie/plant community vegetation mapping has been accomplished at various levels of success (69- to 90-percent accuracy). However, several investigators have obtained encouraging initial results in range biomass (forage production) estimation and range readiness predictions. Soil association map correction and soil association mapping in new area appear to have been proven feasible on large areas; however, testing in a complex soil area should be undertaken. Author

N74-33875* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LAND USE AND MAPPING
Armond T. Joyce *In its* 3rd ERTS Symp., Vol. 3 May 1974 p 15-32 refs (For availability see N74-33873 23-13)
CSCL 08B

This summary is divided into two basic sections-one dealing with land use classification and delineation, and the other dealing with mapping. The term land use classification is used in respect to the actual use of land rather than land capability, land suitability, or the potential use of land. The classification of actual use of the land, as defined by man's activities that are related to the land, may be only inferred, rather than directly interpreted, in the case of the identification and classification of some surface features or vegetation cover types. Also, in the case of some surface features or vegetational cover types, the specific activity involving man's use of the land may not be designated in a four-level classification system until level 3 or level 4 is reached. Most investigations employed or implied a hierarchial land use classification scheme with more than two levels, but mainly addressed themselves to classifying and delineating surface features (land use) that would fall in the first two levels of a three- or four-level hierarchial scheme. Although not all investigators used a hierarchial classification scheme or concurred with the idea (computer-implemented classifications with digital data are not conducive to a hierarchial classification approach), the classification system proposed by the U.S. Department of the Interior is used as reference. Author

N74-33876* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MINERAL RESOURCES, GEOLOGICAL STRUCTURE, AND LANDFORM SURVEYS
Nicholas M. Short *In its* 3rd ERTS Symp., Vol. 3 May 1974 p 33-51 refs (For availability see N74-33873 23-13)
CSCL 08G

Diagnostic ERTS imagery has been used to pinpoint surface conditions associated with known mining districts. These include enhancements which depict hitherto unrecognized surface alteration and allow analysis of ore-controlling fractures distribution in a regional context. ERTS has likewise provided observational data containing previously unrecognized surface anomalies in large oil-producing basins which correlate closely with known oil fields. These observational data offer promise of providing new and powerful techniques for oil exploration, especially if further work using more sophisticated enhancement-processing proves capable of emphasizing the anomalies. ERTS is showing a better-than-anticipated potential for producing accurate small-scale (large-

area) geologic maps, often containing details that were previously not recorded on similar regional maps. The maps produced from ERTS imagery can be prepared more effectively than previously possible, mainly because of the synoptic, multispectral, and repetitive character of ERTS data. ERTS has also provided extensive information on possible geologic hazards. Many new fractures have been identified in several regions of the Pacific Coast seismic belt that have histories of recent earthquakes. This has obvious implications for engineering projects such as dams, aqueducts, and transportation routes. In the mid-continent area, ERTS data have been used to predict zones of rooffall danger in a working coal mine from newly discovered lineations (probably fractures) used as indicators of hazards. Author

N74-33877* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WATER RESOURCES
Vincent V. Salomonson *In its* 3rd ERTS Symp., Vol. 3 May 1974 p 52-82 refs (For availability see N74-33873 23-13)
CSCL 08H

Substantial progress has been made in applying ERTS-1 data to water resources problems, nevertheless, more time and effort still appear necessary for further quantification of results, including the specification of thematic measurement accuracies. More modeling can be done very profitably. In particular, more strategy models describing the processes wherein ERTS-1 data would be acquired, analyzed, processed, and utilized in operational situations could be profitably accomplished. It is generally observed that the ERTS-1 data applicability is evident in several areas and that the next most general and substantive steps in the implementation of the data in operational situations would be greatly encouraged by the establishment of an operational earth resources satellite organization and capability. Further encouragement of this operational capability would be facilitated by all investigators striving to document their procedures as fully as possible and by providing time and cost comparisons between ERTS-1 and conventional acquisition approaches. Author

N74-33878* National Aeronautics and Space Administration. Earth Resources Labs., Bay St. Louis, Miss.
MARINE RESOURCES
E. Lee Tilton, III *In its* 3rd ERTS Symp., Vol 3 May 1974 p 83-106 refs (For availability see N74-33873 23-13)
CSCL 08C

Techniques have been developed for defining coastal circulation patterns using sediment as a natural tracer, allowing the formulation of new circulation concepts in some geographical areas and, in general, a better capability for defining the seasonal characteristics of coastal circulation. An analytical technique for measurement of absolute water depth based upon the ratios of two MSS channels has been developed. Suspended sediment has found wide use as a tracer, but a few investigators have reported limited success in measuring the type and amount of sediment quantitatively from ERTS-1 digital data. Significant progress has been made in developing techniques for using ERTS-1 data to locate, identify, and monitor sea and lake ice. Ice features greater than 70 meters in width can be detected, and both arctic and antarctic icebergs have been identified. In the application area of living marine resources, the use of ERTS-1 image-density patterns as a potential indicator of fish school location has been demonstrated for one coastal commercial resource, menhaden. ERTS-1 data have been used to locate ocean current boundaries using ERTS-1 image-density enhancement, and some techniques are under development for measurement of suspended particle concentration and chlorophyll concentration. The interrelationship of water color and surface characteristics (sea state) are also being studied to improve spectral and spatial interpretive techniques. Author

N74-33879* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ENVIRONMENT SURVEYS
Lawrence R. Greenwood *In its* 3rd ERTS Symp., Vol. 3 May 1974 p 107-122 refs (For availability see N74-33873 23-13)
CSCL 08B

Environment applications are concerned with the quality, protection, and improvement of water, land, and air resources and, in particular, with the pollution of these resources caused by man and his works, as well as changes to the resources due to natural phenomena (for example, drought and floods). The broad NASA objectives related to the environment are directed toward the development and demonstration of the capability to monitor remotely and assess environmental conditions related to water quality, land and vegetation quality, wildlife resources, and general environment. The contributions of ERTS-1 to these subdiscipline areas are broadly summarized. Author

N74-33880* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INTERPRETATION TECHNIQUES
James L. Dragg *In its* 3rd ERTS Symp., Vol. 3 May 1974 p 123-143 refs (For availability see N74-33873 23-13)
CSCL 05B

The image enhancement and geometric correction and registration techniques developed and/or demonstrated on ERTS data are relatively mature and greatly enhance the utility of the data for a large variety of users. Pattern recognition was improved by the use of signature extension, feature extension, and other classification techniques. Many of these techniques need to be developed and generalized to become operationally useful. Advancements in the mass precision processing of ERTS were demonstrated, providing the hope for future earth resources data to be provided in a more readily usable state. Also in evidence is an increasing and healthy interaction between the techniques developers and the user/applications investigators. Author

N74-33881*# Pennsylvania Univ., Philadelphia. Dept. of Geology.
PHASE EQUILIBRIA STUDY OF PSEUDOBROOKITE TYPE MINERALS Final Technical Report
John J. Friel 27 Sep. 1974 17 p refs
(Grant NsG-7031)
(NASA-CR-140490) Avail: NTIS HC $4.00 CSCL 08G

Pseudobrookite, is found in volcanic rocks, and the mineral armalcolite ((Fe,Mg)Ti2O5) found in the Apollo 11 and subsequent lunar samples seems to be unique to the moon. In plutonic rocks on the earth, ilmenite and rutile were found with what appears to be an equilibrium liquidus texture, while on the moon armalcolite often appears to be the primary liquidus phase among Ti-oxides. This suggests that total pressure may be a factor in the formation of these minerals, and a knowledge of the phase relations in this system yields information about the pressure under which a given magma crystallized. Author

N74-33882*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
INTERHEMISPHERIC COMPARISON OF ATMOSPHERIC CIRCULATION FEATURES AS EVALUATED FROM NIMBUS SATELLITE DATA. A COMPARISON OF THE STRUCTURE AND FLOW CHARACTERISTICS OF THE UPPER TROPOSPHERE AND STRATOSPHERE OF THE NORTHERN AND SOUTHERN HEMISPHERES Ph.D. Thesis. Annual Report, 1 Nov. 1973 - 31 Oct. 1974
E. R. Reiter, R. Adler, and Alice Fields 31 Oct. 1974 170 p refs
(Grant NGR-06-002-098; Contract AT(11-1)-1340)
(NASA-CR-140489) Avail: NTIS HC $11.50 CSCL 04A

The general circulations of the Northern and Southern Hemispheres are compared with regard to the upper troposphere and stratosphere, using atmospheric structure obtained from multi-channel radiance data from the satellite infrared spectrometer instrument aboard the Nimbus 3 spacecraft. The interhemispheric comparisons are based on two months of data (one summer month and one winter month) in each hemisphere. Topics studied include: (1) mean meridional circulation in the Southern Hemisphere stratosphere; (2) mangnitude and distribution of tropospheric eddy heat flux; (3) relative importance of standing and transient eddies in the two hemispheres; (4) magnitudes of energy cycle components; and (5) the relation of vortex structure to the breakdown climatology of the Antarctic stratospheric polar vortex. Author

N74-33883*# Scientific Translation Service, Santa Barbara, Calif.
ALTITUDE DISTRIBUTION OF IONOSPHERIC NONHOMOGENEITIES RESPONSIBLE FOR DIFFUSE REFLECTIONS OF SIGNALS ABOVE DUSHANBE

O. Alimov, L. M. Yerukhimov, and L. N. Rubtsov Washington NASA Oct. 1974 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Tadzh. SSR (Stalinabad), v. 16, no. 12, 1973 p 25-28
(Contract NASw-2483)
(NASA-TT-F-15939) Avail: NTIS HC $4.00 CSCL 04A

The altitude distribution of small-scale (1 < 1-3 km) nonhomogeneities of the ionosphere at various latitudes is investigated in order to understand the nature of their origin. The distribution at altitudes below the height Z sub 0 of the F sub 2 layer maximum is studied by analyzing the frequency dependence of the magnitude of the diffuse reflections of signals on vertical sounding ionograms (the F spread phenomenon). Author

N74-33884*# Kanner (Leo) Associates, Redwood City, Calif.
ELECTRICAL AND RADIATION CHARACTERISTICS OF WATER IN THE DECIMETER AND METER RANGE
V. Yu. Rayzer, Ye. A. Sharkov, and V. S. Etkin Washington NASA Oct. 1974 68 p refs Transl. into ENGLISH from the Russian report PR-164
(Contract NASw-2481)
(NASA-TT-F-15967; PR-164) Avail: NTIS HC $6.50 CSCL 07D

An examination was made of the effect of the temperature and salinity of sea water on its dielectric constants and the radiation characteristics of a smooth water surface in the 10-200 cm wavelength range. With reference to the dependence of the dielectric constants on temperature and salinity, and also the effect of atmospheric glow, it was shown that the optimal working range of the working wavelengths for investigating the distribution of the salinity of the ocean by passive remote methods is the 60-80 cm range. A 43.5 K decrease in the radiobrightness temperature corresponds to a 0-30 per mil salinity change, at the wavelength of 75 cm and the radiating surface temperature of 20 C. Experimental material is compared with the theoretical calculations. Author

N74-33885*# Kanner (Leo) Associates, Redwood City, Calif.
PROBLEMS OF CALCULATING THE THERMAL RADIATION OF MULTILAYERED STRUCTURES OF THE ICE AND SNOW TYPES BY MEANS OF ORIENTED GRAPHS USING AN ELECTRONIC COMPUTER
M. D. Rayev, Ye. A. Sharkov, T. A. Shiryayeva, and V. S. Etkin Washington NASA Oct. 1974 26 p refs Transl. into ENGLISH from the Russian report PR-178
(Contract NASw-2481)
(NASA-TT-F-15965; PR-178) Avail: NTIS HC $4.50 CSCL 08L

A computer-aided method is described for calculating the radio emission of multilayered structures with the use of oriented graphs. This method makes it possible to analyze the radio emission of complex layered structures with any number of layers in thickness and with arbitrary electrical parameters. Only small outlays of machine time are required. As an example, the calculation and analysis of the radio emission of layered structures of the snow-ice-water, water-ice, and ice-ground types were carried out. Author

N74-33886*# South Dakota State Univ., Brookings. Remote Sensing Inst.
REMOTE SENSING TECHNIQUES FOR MAPPING RANGE SITES AND ESTIMATING RANGE YIELD
L. A. Benson, C. J. Frazee, F. A. Waltz, C. Reed, R. L. Carey, and J. L. Gropper Jun. 1974 48 p refs Prepared in cooperation with Bureau of Indian Affairs, Aberdeen, South Dakota
(Grant NGL-42-003-007)
(NASA-CR-140394; SDSU-RSI-73-19) Avail: NTIS HC $5.50 CSCL 08B

Image interpretation procedures for determining range yield and for extrapolating range information were investigated for an area of the Pine Ridge Indian Reservation in southwestern South Dakota. Soil and vegetative data collected in the field utilizing a grid sampling design and digital film data from color infrared film and black and white films were analyzed statistically using correlation and regression techniques. The pattern recognition techniques used were K-class, mode seeking, and thresholding. The herbage yield equation derived for the detailed test site was used to predict yield for an adjacent similar field. The herbage yield estimate for the adjacent field was 1744 lbs. of dry matter per acre and was favorably compared to the mean yield of 1830 lbs. of dry matter per acre based upon ground observations. Also an inverse relationship was observed between vegetative cover and the ratio of MSS 5 to MSS 7 of ERTS-1 imagery. Author

N74-33887# Atomic Energy Commission, Washington, D.C.
ENVIRONMENT Subpanel Report 14 used in Preparing the AEC Chairmans Report to the President
S. M. Greenfield 27 Oct. 1973 402 p
(WASH-1281-14) Avail: NTIS HC $23.25

Two basic conclusions are drawn with respect to the challenge of preventing environmental degradation: first, development and implementation of energy systems for achieving and maintaining energy self-sufficiency clearly must be sensitive to the effects that the systems will have on health, welfare, and ecosystems. Second, if this sensitivity is rationally incorporated into the development and implementation of energy processes, these domestic resources can be broadly utilized in harmony with the environment. The achievement of this second point is the fundamental goal to which this environmental research agenda is directed. This agenda consists of four environmental science subprograms constructed by projecting presently known and anticipated concerns for the impacts of existing and developmental energy systems on the environment. These subprograms are: (1) pollutant characterization, measurement, and monitoring; (2) transport processes; (3) effects (health, ecological welfare, and social); and (4) environmental assessment and policy formulation. A total FY 1975-1979 funding level of $863.7 million is broken down for each year for each subprogram. NSA

N74-33888# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
THEORY OF DYNAMICAL AFFINE AND CONFORMAL SYMMETRIES AS GRAVITY THEORY
A. B. Borisov and V. I. Ogievetsky 1974 24 p refs
(JINR-E2-7684) Avail: AEC Depository Libraries HC $4.25

The invariance with respect to the infinite-dimensional general covariance group is equivalent to the invariance with respect to the affine and conformal groups simultaneously. The nonlinear realizations of affine group (the Poincare group being the stability subgroup) lead to the symmetry tensor field as the Goldstone field. The requirement that the theory also corresponds at the same time to the realizations of conformal group, results uniquely in the tensor field theory which equations coincide with the Einstein equations. Thus, it becomes clear that the theory of gravitation is that of spontaneous breaking of the affine and conformal symmetries, just as the chiral dynamics is the theory of the spontaneous breaking of the chiral symmetry. The analogy established suggests some new aspects of possible gravity effects in elementary particle physics. Author (NSA)

N74-33889# Edgerton, Germeshausen and Grier, Inc., Los Alamos, N.Mex.
PAYLOAD PERFORMANCE OF SHAPED CHANGED BARIUM RELEASES
D. Wright, W. Broste, T. Eastman, and H. M. Peek 8 Apr. 1974 22 p ref Presented at the Am. Geophys. Union Meeting, Washington, D. C., 8 Apr. 1974 Sponsored by AEC
(EGG-1183-1629; Conf-740435-1) Avail: NTIS HC $4.25

The utilization of a unidirectional barium jet generated by a shaped-charge explosive for visibly tracing out geomagnetic field lines is considered in terms of optical observations and analysis for events LORO, OOSIK, and CHACHALACA. NSA

N74-33890# California Univ., Livermore. Lawrence Livermore Lab.
ADPIC: A THREE DIMENSIONAL COMPUTER CODE FOR THE STUDY OF POLLUTANT DISPERSAL AND DEPOSITION UNDER COMPLEX CONDITIONS
18 Oct. 1973 62 p refs
(Contract W-7405-eng-48)
(UCRL-51462) Avail: NTIS HC $5.45

ADPIC is a three-dimensional, Cartesian, particle-diffusion code, capable of calculating the time-dependent dispersion of inert or radioactive air pollutants under many conditions, including

stratified shear flow, calms, topography, and wet and dry deposition, for individual or multiple instantaneous or continuous sources and space- and time-variable diffusion parameters. The code solves the three-dimensional diffusion-advection equation by the pseudovelocity technique for a given mass-consistent advection field. The method is based on the particle-in-cell technique with the pollutant concentration represented by Lagrangian particles in an Eulerian grid mesh. ADPIC has been verified for a number of selected advection-diffusion problems for which analytic solutions are available, and has been found to give results to within + or - 5% of the analytic solutions.
Author (NSA)

N74-33891# Oak Ridge National Lab., Tenn.
ENVIRONMENTAL QUALITY INDICES Final Report, 15 Jun. 1972 - 31 May 1973
W. A. Thomas Jul. 1973 38 p refs Sponsored in part by NSF
(Contract W-7405-eng-26)
(ORNL-NSF-EP-70) Avail: NTIS HC $5.00

A final report is presented which summarizes work conducted at ORNL during the period from June 15, 1972 to June 1, 1973 on environmental indices. Information is included on: the distribution and use of the Oak Ridge Air Quality Index; development of both a statistically-based index, APINDEX, and a dual-purpose index for evaluating short- and long-term trends in air quality; work on water quality indices at Vanderbilt University and by the National Sanitation Foundation; publication of a bibliography on Biological Indicators of Environmental Quality; correlations of air quality indices with human health; and methods of implementing a system of environmental indicators. NSA

N74-33892# Brookhaven National Lab., Upton, N.Y.
ISOTOPE AND CONCENTRATION MEASUREMENTS OF STRATOSPHERIC SULFATE
A. W. Castleman, Jr., H. R. Munkelwitz, and B. Manowitz Dec. 1973 19 p refs Presented at the Intern. Conf. on Struct., Composition and Gen. Circulation of the Upper and Lower Atmospheres and Possible Anthropogenic Perturbations, Melbourne, 14-25 Jan. 1974; Sponsored by Intern. Assoc. of Meteorology and Atmospheric Phys. Sponsored in part by AEC and DOT
(BNL-18617; Conf-740106-1) Avail: NTIS HC $3.00

Trends in concentration and S-32/S-34 isotopic ratio of the sulfur component of stratospheric aerosols were investigated to assess the significance of possible sources, and establish the contribution from in situ gas-to-particle reactions. Concentration and isotopic values were found to undergo regular cyclic changes following a few major explosive volcanic eruptions. The results show that the major perturbations to the low-level persistant aerosol layer result from a few volcanic eruptions. Author

N74-33893# Tennessee Univ., Knoxville.
TIDAL TRANSIENT FAR-FIELD MODEL FOR OFFSHORE THERMAL DISCHARGES
A. H. Eraslan and M. Siman-Tov 1974 6 p refs Presented at Ann. Meeting of the Am. Nucl. Soc., Philadelphia, 23 Jun. 1974 Sponsored by AEC
(Conf-740608-7) Avail: NTIS HC $4.00

A far-field two-dimensional thermal energy transfer model is presented for simulating temperature distributions resulting from the condenser cooling water discharges of offshore power plants in large coastal regions. The vertical variations of the velocity components and thermal stratification effects which usually exist in coastal regions are rigorously incorporated in the model by considering multi-layer flow conditions in the formulation. The mathematical formulation employs the integral forms of the conservation principles for mass and energy in individual, variable-sized discrete elements that span the large coastal region. Author (NSA)

N74-33894# Kiruna Geophysical Observatory (Sweden).
STUDIES OF AURORAL ABSORPTION SUBSTORMS Ph.D. Thesis - Umeaa Univ., Swed.
Agge Theander Apr. 1972 118 p refs
(KGO-723) Avail: NTIS HC $9.00

A synoptic study based on 60 auroral absorption events is presented. The events took place during the International Quiet Sun Year, the International Active Sun Year, and the winter of 1970. Measurements were taken by a riometer and a photometer at 45 deg elevation for the winter 1970 events. For the other categories 40 riometer observatory data were reduced. The fine structure of the 1970 events is detailed with regard to auroral forms, spatial variation of the ratio between square root of luminosity and absorption, and temporal variation of absorption and its relation to luminosity. Results show that the low energy and high energy parts of the auroral spectrum are very independent. Correlation between all 60 events led to the proposal of an average substorm model. The model departs considerably from previous models leading to the conclusion that several physical mechanisms are superimposed. The parameters studied were substorm initiation, east/west drifts, north/south elongations, and longitudinal variations. A bibliography containing 127 selected articles from 1960 to 1970 is attached. ESRO

N74-33895# World Meteorological Organization, Geneva (Switzerland).
THE GARP ATLANTIC TROPICAL EXPERIMENT (GATE) INTERNATIONAL OPERATIONS PLAN. PART 3: AIRCRAFT PLAN
Mar. 1974 244 p refs Prepared jointly with Intern. Council of Sci. Unions
(GATE-11-Pt-3) Avail: NTIS HC $15.25; WMO, Geneva

The aircraft operations plant of GATE is described. The aircraft will probe the tropical atmosphere on the D- and C-scale and will provide appreciable and important information for studies of the planetary boundary layer and the surface of the ocean. The flight arrangements, air traffic control, and mission plans are also discussed. ESRO

N74-33896# World Meteorological Organization, Geneva (Switzerland).
A GARP ATLANTIC TROPICAL EXPERIMENT (GATE) INTERNATIONAL OPERATIONS PLAN. PART 2: SHIP OPERATIONS
Y. V. Tarbeev and S. R. Petersen Feb. 1974 237 p Prepared jointly with Intern. Council of Sci. Unions
(GATE-10-Pt-2) Avail: NTIS HC $15.00; WMO, Geneva

The ship operations plan of GATE, which coordinates the various scientific and operational aspects of the participating ships and also determines their position and role in the achievement of the main experiment objectives, is described. The observation schedule and procedures, intercomparisons at sea, data records and communication facilities are also discussed. ESRO

N74-33897# World Meteorological Organization, Geneva (Switzerland).
THE SYNOPTIC-SCALE SUB-PROGRAMME FOR THE GARP ATLANTIC TROPICAL EXPERIMENT
David D. Houghton and David E. Parker Feb. 1974 119 p refs Prepared jointly with Intern. Council of Sci. Unions
(GATE-6) Avail: NTIS HC $9.00; WMO, Geneva

The scientific objectives of the GATE synoptic-scale subprogram are outlined and data requirements, acquisition, intercomparison, and validation are discussed. Tasks during the field phase are noted and the aims and allocation of responsibilities during the operational forecasting program are presented. ESRO

N74-33898# World Meteorological Organization, Geneva (Switzerland).
REPORT OF THE NINTH SESSION OF THE JOINT ORGANIZING COMMITTEE FOR GARP
Jan. 1974 98 p Conf. held at Canberra, Australia, 8-12 Jan. 1974 Prepared jointly with Intern. Council of Sci. Unions
Avail: NTIS HC $8.00; WMO, Geneva

Following the chairman's report, summaries were presented of the numerical experimentation program, the GARP Atlantic Tropical Experiment, the Global Experiment, and other related programs. The organization of future work was also discussed.
ESRO

N74-33899# World Meteorological Organization, Geneva (Switzerland).
THE CONVECTION SUB-PROGRAMME FOR THE GARP ATLANTIC TROPICAL EXPERIMENT
D. Rodenhuis and A. Betts May 1974 136 p refs Prepared

jointly with Intern. Council of Sci. Unions
(GATE-7) Avail: NTIS HC $10.00; WMO, Geneva

The scientific basis and objectives of the GATE convection subprogram are discussed and its contribution to the overall GATE program noted. A description of the scale phenomena (tropical wave, cloud cluster, meso and cumulus scale) is given and the basic observations required to describe them are summarized. An analysis of the various interactions and their modelling by parameterization are discussed together with aspects of data management. ESRO

N74-33900# World Meteorological Organization, Geneva (Switzerland).
THE OCEANOGRAPHIC SUB-PROGRAMME FOR THE GARP ATLANTIC TROPICAL EXPERIMENT
G. Philander, M. Miyake, Y. Tarbeev, and T. DelaMoriniere Mar. 1974 145 p refs Prepared jointly with Intern. Council of Sci. Unions
(GATE-8) Avail: NTIS HC $10.25; WMO, Geneva

The background and objectives of the GATE oceanographic subprogram are discussed and its relation to the overall GATE program, noted. Oceanographic experiments to be conducted from stationary and moving platforms are described and the supporting activities at GOCC considered. Aspects of data management are discussed and the projects and principles investigators are given. ESRO

N74-33901# World Meteorological Organization, Geneva (Switzerland).
THE GARP ATLANTIC TROPICAL EXPERIMENT (GATE) INTERNATIONAL OPERATIONS PLAN. PART 5: TELECOMMUNICATIONS
Apr. 1974 220 p Prepared jointly with Intern. Council of Sci. Unions
(GATE-12-Pt-5) Avail: NTIS HC $14.00; WMO, Geneva

The telecommunications plan of GATE is described. All GATE observing platforms including ships, aircraft, buoys, and ground stations will communicate with each other through different telecommunication centers in accordance with this plan. The organization, procedures, and schedules for the transmission and reception of the different information needed during the duration of GATE is described. The GATE telecommunications manual is also included. ESRO

N74-33902# World Meteorological Organization, Geneva (Switzerland).
THE INTERNATIONAL DATA MANAGEMENT PLAN FOR THE GARP ATLANTIC TROPICAL EXPERIMENT. PART 1: GENERAL DESCRIPTION OF THE GATE DATA MANAGEMENT SCHEME AND ITS SPECIFICATION
T. C. DeLaMoriniere Apr. 1974 234 p Prepared jointly with Intern. Council of Sci. Unions
(GATE-13-PT-1) Avail: NTIS HC $14.75; WMO, Geneva

The descriptions, definitions and general specifications for the international aspects of GATE data management are given, the objectives of which are to assemble an international data set for GATE and to assist in making it available to scientific users. ESRO

N74-33903# Kiruna Geophysical Observatory (Sweden).
DYNAMICS OF DAY AND NIGHT AURORA DURING SUBSTORMS
V. G. Vorobjev (Polar Geophys. Inst.), G. Gustafsson, G. V. Starkov (Polar Geophys. Inst.), Y. I. Feldstein (Inst. of Terrest. Magnetism, Ionosphere, and Radio Wave Propagation), and N. F. Shevnina (Inst. of Terrest. Magnetism, Ionosphere, and Radio Wave Propagation) Apr. 1974 21 p refs Submitted for publication
(KGO-Preprint-74-301) Avail: NTIS HC $4.25

The motion of auroral forms on the day and nightside of the earth was studied during different substorm phase by means of all-sky camera films. A substorm is characterized by a shift of the luminescence region towards the equator both at noon and midnight; however, individual forms drift predominantly towards the pole on the dayside and towards the equator on the nightside. The velocity of the poleward motion is largest during the expansive phase of a substorm and amounts on the average to 330 m/sec but even during relatively quiet magnetic conditions a poleward motion is observed. Author (ESRO)

N74-33904# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
THE PRECISE MEASUREMENT OF SMALL GRAVITY DIFFERENCES Ph.D. Thesis - Tech. Hochschule Darmstadt, West Ger. [DIE GENAUE MESSUNG VON KLEINEN SCHWEREUNTERSCHIEDEN]
Carl Gerstenecker Bayerische Akad. der Wiss. 1973 80 p refs In GERMAN
(Ser-C/Diss-191) Avail: NTIS HC $7.00

The measurement of small gravity differences is at present not possible within an accuracy of plus or minus 1 microgal. An average error for a gravity difference measured several times is plus or minus 5 to 10 microgal. The errors are caused by instrument errors, calibrating function errors, and insufficiently accurate corrections and evaluation methods. The accuracy of a test result can be improved by using several instruments. By careful examination of these instruments and their calibrating function, and a special test arrangement, an average error for the mean of a small gravity difference, measured several times, of 3 microgal may be expected. ESRO

N74-33905# Instituto Geografico y Catastral, Madrid (Spain). Seccion de Geomagnetismo y Aeronomia.
SECULAR VARIATION OF THE VERTICAL INTENSITY Z. COMPARISON WITH THEORETICAL MODELS [VARIACION SECULAR DE LA COMONENTE VERTICAL Z COMPARACION CON MODELOS TEORICOS]
Fernando AranazydelRio 1974 19 p refs In SPANISH; ENGLISH summary Presented at the 31st Port.-Spanish Congr. for the Progr. of Sci.
Avail: NTIS HC $4.00

The secular variations of the vertical component Z of the geomagnetic field recorded from magnetic observatories of Spain and Portugal during the period 1.965,5 to 1.968,5 are analyzed. The observed values are compared to values calculated using theoretical models POGO 8/69 and IGRF 1.965,0, and some anomalies are pointed out. Special attention is paid to anomalies observed from island observatories (Santa Cruz de Teneriffe and San Miguel). ESRO

N74-33906# Royal Netherlands Meteorological Inst., De Bilt.
THE EARTHQUAKE MECHANISMS OF THE BALKAN REGION Final Report
A. R. Ritsema Jan. 1974 100 p refs
(Contract UNESCO-256.280)
(KNMI-WR-74-4) Avail: NTIS HC $8.00

Compression and dilatation data of 702 earthquakes of the Balkan region were investigated in order to determine the focal mechanism. Two hundred-fifty-six shocks produced reasonably good solutions that can be used for an evaluation of the regional earthquake generating stress systems. The solutions were divided into four different groups: pressure type with reversed faults, tension type with normal faults, thrust type with thrust or vertical faults, and transcurrent type with faults of the strike-slip kind. Significant differences in distribution of these types with depth were demonstrated: percentages of transcurrent and tension type earthquakes decrease with depth, those of pressure and thrust type increase with depth. For the region as a whole, the direction of tectonic transport is in northeast and southwest azimuths. ESRO

N74-33907# Royal Netherlands Meteorological Inst., De Bilt.
FOURIER ANALYSIS OF A SEISMIC SIGNAL [FOURIER-ANALYSE VAN EEN SEISMISCH SIGNAAL]
T. deCrook and I. Csikos 1974 41 p refs In DUTCH; ENGLISH summary
(KNMI-WR-74-9) Avail: NTIS HC $5.25

A method was developed to compute the Fourier integrals of a seismic signal by using a polynomial approximation as a substitution for the Fourier integrals, so that they can, in turn, be calculated. The methods used to compute the coefficients of the polynomial approximation are discussed, and the ALGOL program used for the calculations is described, along with pertinent applications. ESRO

N74-33908# European Space Research Organization, Paris (France).
EARTH RESOURCES AIRCRAFT FACILITY. VOLUME 1:

SUMMARY
F. Carnec et al Apr. 1974 91 p refs Transl. into ENGLISH of Earth Resources Aircraft Facility Vol. 1 Sommaire de l'Etude Rapport Final, ESRO-CR(P)-117, Soc. d'Etudes Tech. et d'Entreprises Gen., 1972
(ESRO-TT-46; ESRO-CR(P)-117) Avail: NTIS HC $7.75

Results on mission planning for a European earth resources survey aircraft are summarized. They include choice of mission, analysis of payload, choice of aircraft, technical feasibility, initial operational program, and juridical aspects of the Earth Resources Aircraft Facility project. ESRO

N74-33909# Rhode Island Univ., Kingston. School of Oceanography.
FORTRAN PROGRAMS FOR AVERAGING, FILTERING, PLOTTING AND SPECTRAL ANALYSIS OF CURRENT METER OBSERVATIONS ON THE IBM 370/155
William P. Kramer Apr. 1974 95 p refs
(Contract N00014-68-A-0215-0003; NR Proj. 083-165)
(AD-779873; Ref-74-1) Avail: NTIS CSCL 08/3

The FORTRAN programs used for the processing of current meter analysis at the University of Rhode Island are described in detail. The programs are run on the IBM 370/155 computer. Remote access to this system is achieved via a Cope 1200 batch station on the Narragansett Bay Campus. Graphic output is done on a Broomall M-2000 drum plotter. These programs perform vector averaging, smoothing, spectral analysis and handle the graphic display of components and progressive vector diagrams. Data may be accessed on disk, tape or cards and may be in Cartesian or polar form. Sample output figures are included to show the relationship of input variables and output performance. Author (GRA)

N74-33910# Washington State Dept. of Highways, Olympia.
COOPERATIVE PHOTOGRAMMETRIC STUDY Final Technical Report
S. A. Veress, A. A. Aramaki, J. K. Hall, and T. Takamoto Feb. 1974 159 p refs Prepared by Wash. Univ., Seattle
(Contract DOT-Y-1431)
(PB-232051/3; RPR-16.1) Avail: NTIS HC $5.00 CSCL 08B

The research project was to evaluate the different variables in photogrammetric practice, which include targeting, film and development process, camera platform and achievable accuracy. Design criteria and standards have been established, which include the manufacturing of camera suspension for helicopter from both a theoretical and practical point of view. The testing of these standards and design criteria includes a large number of data. Thus, they have a high statistical probability of being correct. The project has proved that an all-time photography is possible with the proper selection of camera platform, and that the use of very low flight photography will enable the Highway Department to extend the use of photogrammetric measurement.
Author (GRA)

N74-33911# American Society of Civil Engineers, New York.
INNOVATION: A CASE STUDY
M. B. McPherson Feb. 1974 66 p refs
(Contract DI-14-31-0001-9009)
(PB-232166/9; TM-21; OWRR-C-4048(9009)(4)) Avail: NTIS HC $3.75 CSCL 13B

Four urban water resource case studies are employed as a means for elucidating causation inferences on the process of technological innovation: San Francisco master plan; Chicago underflow plan; land disposal of wastewater; and pressure wastewater sewer systems. All four are instances where innovation concepts have been successfully applied, and they are all concerned with water quality matters. Consideration is given to industrial parallels, the roles of individuals versus groups in innovation, and certain characteristics of some leading innovative local government administrators. Also taken into account are related subjects of technology transfer and public technology.
GRA

N74-33912# Environmental Research and Technology, Inc., Lexington, Mass.
COLLECTION AND ANALYSIS OF OBSERVATIONAL DATA PERTINENT TO CIAP, VOLUME 1 Annual Progress Report
Norman E. Gaut Jul. 1973 59 p refs
(Contract DOT-OS-20217)
(PB-231957/2; APR-1) Avail: NTIS HC $6.00 CSCL 04A

Progress is documented by ERT for the period August 1972 through July 1973 in the two major tasks it has undertaken as its contribution to the Climatic Impact Assessment Program: the collection and analysis of observational data related to the dynamics of the atmosphere; and the collection and analysis of observational data of the trace constituents (gases) of the stratosphere. This volume focuses on the first task, that of collecting and analysis data related to the dynamics of the atmosphere. The objective is the assessment of the potential impact of an operational fleet of supersonic aircraft on the climate of the earth. GRA

N74-33913# Environmental Research and Technology, Inc., Lexington, Mass.
OBSERVATION AND ANALYSIS OF TRACE CONSTITENTS IN THE STRATOSPHERE Annual Report, Aug. 1972 - Jul. 1973
Mao-Fou Wu Jul. 1973 230 p refs
(Contract DOT-OS-20217)
(PB-231958/0; ERT-P-393; DOT-TST-74-7) Avail: NTIS HC $6.00 CSCL 04A

A detail survey and extensive analysis of atmosphere trace constituents in the stratosphere have been made. The data collected include all available measurements of atmospheric ozone, water vapor, methane, carbon monoxide, carbon dioxide, nitrous oxide, nitrogen dioxide and nitric acid. Results are presented as tables and graphs. A comprehensive review of the physics, chemical reactions and major unsolved problems for each of the constituents is also presented. The results of a scientific study to derive large scale eddy coefficients in the stratosphere using the ozone analysis are included as an appendix. Author (GRA)

N74-33914# Geological Survey, Menlo Park, Calif.
PRINCIPLE FACTS FOR 1230 GRAVITY STATIONS IN THE LOS ANGELES 1 BY 2 DEGREE QUADRANGLE, CALIFORNIA Final Report
William F. Hanna and Robert F. Sikora 1974 47 p refs
(PB-231909/3; USGS-GD-74-014) Avail: NTIS HC $5.50 CSCL 08E

A total of 1230 gravity stations were obtained using LaCoste and Romberg geodetic gravity meters during the period 1965-1973 in the Los Angeles 1 by 2 degree quadrangle, California. This quadrangle extends from 34 to 35N lat. and from 118 to 120W long. A list of principal facts included in the report consists of station number with location code, latitude, longitude, elevation, observed gravity, free-air anomaly, terrian correction, and Bouguer anomaly. Reduction to Bouguer anomalies was achieved using a density of 2.67 g/cc and terrain corrections to a distance of 166.7 km. GRA

N74-33915# Illinois Univ., Urbana. Water Resources Center.
HYDROLOGIC MODELS OF THE GREAT LAKES
Dale D. Meredith Apr. 1974 40 p refs
(Contract DI-14-31-0001-3580)
(PB-232163/6; UILU-WRC-74-0081; WRC-RR-81; OWRR-B-062-ILL(2)) Avail: NTIS HC $3.25 CSCL 08H

It is demonstrated that net basin supply values (equivalent to precipitation on the lake minus the evaporation from the lake plus the runoff into the lake) obtained from water balance studies without accounting for the thermal expansion and contraction of water may be in error by as much as 100 percent during some months for each lake. The individual hydrologic components are assumed to be normally distributed for each month and linear regression equations are estimated for predicting the value of the individual monthly hydrologic components. It is shown that some of the hydrologic components for down wind (in this case downstream) lakes are dependent upon hydrologic events for the upwind lakes. This is particularly so for precipitation in the down wind lake basins which appears to be highly dependent upon evaporation values for up wind lakes. Author (GRA)

N74-33916# Miami Univ., Coral Gables, Fla.
SOUTH FLORIDA ECOLOGICAL STUDY. APPENDIX G: RECENT AND LONG-TERM VEGETATION CHANGES AND PATTERNS IN SOUTH FLORIDA. PART 1: PRELIMINARY REPORT Interim Report, Jan. 1972 - May 1973

Taylor R. Alexander and Alan G. Crook May 1973 224 p refs
(Contract DI-14-10-9-900-358)
(PB-231939/0; EVER-N-51-App-G-Pt-1; DI-SFEP-74-08-App-G-Pt-1) Avail: NTIS HC $14.25 CSCL 06F

The preliminary report includes methods, ecological history and 10 completed sample of how data and maps for quadrats will be presented in the final rept. Quadrats (sections) will number 100 and will be representative of the entire ecosystem. Vegetation change has been both major and minor. Agriculture, logging, and fire have had the greatest role, augumented by drainage. Examples are: the change from graminoid glade vegetation to a closed canopy of woody species on abandoned farmland; and the invasion of cypress forests by maple and pine. In the saltwater-freshwater ecotone, managroves have invaded inland and fresh water species have been killed. For example, the cabbage palm population has been reduced. Coastal erosion has locally reduced mangrove forests. GRA

N74-33917# North American Weather Consultants, Goleta, Calif.
TWELVE BASIN INVESTIGATION: ANALYSIS OF POTENTIAL INCREASES IN PRECIPITATION AND STREAMFLOW RESULTING FROM MODIFICATION OF COLD OROGRAPHIC CLOUDS IN SELECTED RIVER BASINS OF THE WESTERN UNITED STATES, VOLUME 2 Final Report, 15 May 1972 - 31 Dec. 1973
Robert D. Elliott, Jack F. Hannaford, and Russell W. Shaffer 31 Dec. 1973 193 p refs
(Contract DI-14-06-D-7368)
(PB-232132/1; NAWC-15-18-2-Vol-2) Avail: NTIS HC $12.75 CSCL 08H

The cloud seeding potential for increasing streamflow is discussed for the Upper Missouri, San Joaquin, Deschutes, Bear-Wasatch, and Yakima river basins. Hourly precipitation data for the period October through April each annual was associated with appropriate rawinsonde data, and the precipitation cloud top temperature curves were plotted. The area of effect model was employed in determining predicted seeded precipitation chould top temperature curves, and the predicted curves were fitted to the historical curves based on the predicted not-seeded curve in the critical temperature and colder range. The seeding potential was then calculated from the difference between the predicted curve and the observed historical curve. Mean elevations were specified for the upwind and downwind transition zones and crest zones. Potential incremental streamflow was, by this method, computed for the water years 1951-1952 to 1970-1971. (Modified author abstract) GRA

N74-33918# Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
FULL SCALE DESULFURIZATION OF STACK GAS BY LIMESTONE INJECTION. VOLUME 2: APPENDICES A THROUGH H Final Report
F. E. Gartrell Aug. 1973 331 p refs
(PB-230384/0; EPA-650/2-73-019-B) Avail: NTIS HC $19.75 CSCL 13B

Results are given of a test program of dry limestone injection, demonstrated on a 150-Mu pulverized-coal-fired boiler at TVA's Shawnee Plant. The program included: equipment shakedown, dust distribution studies, process optimization, and long-term injection trials. The program is discussed in context with previous investigations and EPA-sponsored support activities. Appendices contain test program detail results and results of EPA support projects. Because of low SO2 removal efficiencies and the potential for major reliability problems, it does not appear that dry limestone injection will play an important role in controlling SO2 emissions from power plants. GRA

N74-33919# Aerospace Corp., El Segundo, Calif.
ALASKA TO NEW ZEALAND WHISTLER MODE TRANSMISSION AT 6.8 kHz
Donald A. McPherson, Harry C. Koons, Mitchell H. Dazey, Richard L. Dowden, Lew E. S. Amon, and Niel R. Thomson (Otago Univ., New Zealand) 19 Jun. 1974 9 p refs
(Contract F04701-73-C-0074)
(AD-781382; TR-0074(9260-09)-9; SAMSO-TR-74-148) Avail: NTIS CSCL 04/1

The VLF signals that were transmitted by The Aerospace Corporation group at Port Heiden, Alaska, were received by the University of Otago group in Dunedin, New Zealand, in August 1972. The transmitter, using a balloon-supported antenna, was operated at 6.8 kHz with a radiated power of 13W. The signal intensity at Dunedin was 35 uV/m, and the signal delay was determined to be 1.13 plus or minus 0.01 sec. The delay and the existence of natural whistlers indicated there was a high probability that the signals traveled in a duct at L = 2.92 plus or minus 0.04. Estimates of the expected signal strength at Dunedin indicated that a natural amplification of the order of 30 db was probably secured in the duct. Author (GRA)

N74-33920# Army Foreign Science and Technology Center, Charlottesville, Va.
PHYSICS OF THE UPPER ATMOSPHERE
L. A. Katasev 27 Nov. 1973 136 p refs Transl. into ENGLISH from Tr. Inst. Eksp. Meteorol. (USSR), no. 24, 1971
(AD-781201; FSTC-HT-23-591-73) Avail: NTIS CSCL 04/1

By means of Bennet type mass-spectrometers installed in meteor-rockets MR-12, in 1969, investigations were carried out into ion composition at altitudes of the E region in the mid and polar latitudes. In the mid latitudes, mass-spectrometric measurements were carried out in a program of complex investigation of the effects due to solar bursts. Among other experiments, two rocket launches with ion mass-spectrometers were carried out. A comparison was made of the composition in concentrations of ions before and during a magnetic storm accompanying a solar burst. Author (GRA)

N74-33921# Utah State Univ., Logan. Space Science Lab.
ROCKET INSTRUMENTATION FOR ICECAP 73A AURORAL MEASUREMENTS PROGRAM: BLACK BRANT 18.205-1
David A. Burt and Clair S. Davis Feb. 1974 152 p refs
(Contract F19628-72-C-0255; AF Proj. 7663; DNA Proj. NWED-AAXH)
(AD-781184; SR-3; HAES-3; AFCRI-TR-74-0195) Avail: NTIS CSCL 04/1

On 27 March 1973 at 0937 GMT, Black Brant A18.205-1 was launched from the Poker Flat Research Range in Alaska as part of ICECAP 73 - a continuing auroral measurements program. The payload penetrated a bright, stable auroral arc permitting coordinated, simultaneous measurement of the several auroral parameters. Measurements were made of near infrared emissions (1.6 micrometers to 5.4 micrometers), selected visible and ultraviolet emissions, auroral electron fluxes, ion and neutral composition, and ionospheric electron and ion densities and temperatures. Special emphasis was placed on making measurements of infrared emissions in order to increase the knowledge of auroral chemistry and physics and to update predictive computer codes. (Modified author abstract) GRA

N74-33922# Naval Research Lab., Washington, D.C.
EMPIRICAL BAYES ESTIMATION OF THE PROBABILITY DENSITY OF THE RADAR CROSS SECTION OF THE SEA SURFACE Interim Report
Maurice E. B. Owens 13 Jun. 1974 19 p refs
(NRL Proj. R02-97; RR0210141)
(AD-781876; NRL-7741) Avail: NTIS · CSCL 08/10

When sea Clutter is viewed at low grazing angles with a high-resolution radar, the envelope of the return does not have a Rayleigh distribution. Based on the concept of the composite sea surface scattering model, the probability density of the return can be written as the integral of the product of two factors. The first factor is the probability density function of the radar cross section (RCS) of the illuminated patch, and the second is the density of the return conditioned on the cross section. If the patch is large, one can assume that the cross section remains constant. But for a small patch it varies randomly. Two sets of nonparametric estimates of the RCS density of a small patch were obtained. One group of estimates is based on experimental data and the other on a simulation consisting of theoretical models. Because the estimation procedures differ for the two groups, no statistical comparison was made; however, the two sets are considered in good agreement. Author (GRA)

N74-33923# Naval Postgraduate School, Monterey, Calif.
STATISTICAL STUDIES OF WORLD-WIDE SECCHI DATA

M.S. Thesis
Gerald L. York Mar. 1974 146 p refs
(AD-781614; NPS-58TX74031) Avail: NTIS CSCL 08/10

An investigation was made to determine possible correlations between Secchi depths and other simultaneously measured oceanographic parameters which were on file at the National Oceanographic Data Center as of March 1972. Sixty-three one-degree sub-squares occurring in Japanese and Korean waters and eleven Atlantic and Pacific open ocean areas were chosen for linear correlation analysis using both sea surface data and mean values of some fourteen different oceanographic parameters averaged over the Secchi depth. In particular, oxygen measurements exhibited trends toward an inverse proportionality with Secchi depth while temperature indicated a possible direct proportionality. (Modified author abstract) GRA

N74-33924# Earth Satellite Corp., Washington, D.C.
SNOW MAPPING AND RUNOFF FORECASTING: EXAMINATION OF ERTS-1 CAPABILITIES AND POTENTIAL BENEFITS FROM AN OPERATIONAL ERS SYSTEM Interim Report
13 Mar. 1974 227 p refs
(Contract DI-14-08-001-13519)
(PB-232903/5; USGS-DO-74-009) Avail: NTIS HC$6.00 CSCL 08L

Within the broad area of water resources management, the case study focused on snow mapping and related snow runoff forecasts, and particularly the potential benefits from use of improved runoff forecasts in reservoir regulation. Estimated benefits were based on a simulation of the impact of the errors in residual runoff forecasts upon determination of flood storage allocation. Benefits arise by avoiding excessive flood storage allocations and the resulting penalty cost in hydropower generation. The upper limit of potential residual runoff benefits are presented. GRA

N74-33925# National Committee for Geochemistry, Washington, D.C.
ORIENTATIONS IN GEOCHEMISTRY
Jan. 1974 139 p refs
(Contract NSF C-310)
(PB-232690/8; ISBN-0-309-02147-2) Avail: NTIS MF $1.45; National Academy of Sciences, Printing and Publishing Office, 2101 Constitution Ave., Washington, D.C. HC $5.75 CSCL 08D

An effort is made to provide a useful description of the growing field of geochemistry, its scope and potential. The report presents an assessment of current work in geochemistry, analyzes its interrelationships with the other earth and planetary sciences, and suggests directions for progress in the field during the next 5 to 10 years. Discussions center around the four major subject areas of extraterrestrial geochemistry, solid earth geochemistry, exogenic or low-temperature aqueous chemistry, and organic geochemistry. The report also discusses the interrelations of geochemistry and environmental concerns, and the role of geochemistry in understanding the origin of natural resources and contributing to their development. Brief section on experimental techniques and facilities and on data and sample accessiblity complete the report. GRA

N74-33926# Earth Satellite Corp., Washington, D.C.
REPORT OF THE ERS SATELLITE COST BENEFIT STUDY Quarterly Report, Nov. 1973 - Jan. 1974
22 Feb. 1974 96 p refs
(Contract DI-14-08-0001-13519)
(PB-232649/4; USGS-DO-74-007; QR-4) Avail: NTIS HC $4.00 CSCL 08F

Studies in rangeland and water resources management were completed. Others on land use planning and environmental management continued. Recommendations were made for case studies in forestry management to evaluate benefits from timber inventory, assessment and control of destructive agents and fire damage, and estimation of forest vigor; and in environment monitoring to evaluate status of strip mining and reclamation, condition of wetlands, and regional water quality. Technical notes on definition of the environmental monitoring case study, and evaluation of case study potential in marine resource management are presented. GRA

N74-33927# Geological Survey, Reston, Va. Topographic Div.
RESEARCH AND DEVELOPMENT IN TOPOGRAPHIC MAPPING
Apr. 1974 73 p
(PB-232451/5; USGS-TD-74-001) Avail: NTIS HC$3.75 CSCL 08B

The annual report, covering the 12-month period ending in April 1974, summarizes the research and development activities of the U.S. Geological Survey, Topographic Division in the Office of Research and Technical Standards and in the Region offices at Arlington, Va., Rolla, Mo., Denver, Colo., and Menlo Park, Calif. The R and D projects mentioned concern the fields of cartography, field surveys, photogrammetry, orthophotomapping, and space technology. Articles by Division personnel prepared for presentation at meetings and conferences or for publication in professional journals and the Manual of Topographic Instructions are also listed. GRA

N74-33928# Illinois Univ., Urbana. Dept. of Civil Engineering.
A COMPUTER PROGRAM PACKAGE FOR THE GEOMETRIC ANALYSIS OF ERTS-1 IMAGES Final Report
Kam W. Wong Mar. 1974 204 p refs
(Contract DI-14-08-0001-12631)
(PB-232249/3; UILU-ENG-74-2005) Avail: NTIS HC $13.25 CSCL 08B

The report documents nine computer programs which were developed to perform geometric analysis of the RBV images generated from the ERTS-1 television system. These programs may be used for preflight and inflight calibration, distortion analysis using reseau or ground controls, distortion modeling by polynomials, and distortion correction by polynomials or distortion tables. The documentation for each program includes a program description, data input instruction, sample input data and program listing. These programs are also suitable for the geometric analysis of other photographic systems. Author (GRA)

N74-33929# Earth Satellite Corp., Washington, D.C.
RANGELAND CASE STUDY Interim Report
Apr. 1974 242 p refs Prepared jointly with Booz-Allen Applied Research, Inc., Bethesda, Md.
(Contract DI-14-08-001-13519)
(PB-232929/0; USGS-DO-74-008) Avail: NTIS HC$6.00 CSCL 02B

Rangeland management was selected as a case study because it reflects the multi-purpose goals of rangeland management and identifies earth resources satellite-derived information, including inventories for long term range reallocation, monitoring decisions to improve range productivity, and range feed condition. A prospective earth resources satellite (ERS) system could improve rangeland inventories, could make a coordinated system of rangeland monitoring possible, and improve range feed condition reports. The gross annualized discounted benefits of ERS rangeland applications are estimated to be between $8.8 and $30.4 million during the period 1977-86. GRA

N74-33930# Connecticut Univ., Storrs. Inst. of Water Resources.
PROCEEDINGS OF FIRST WETLANDS CONFERENCE
T. Helfgott, M. W. Lefor, and W. C. Kennard Dec. 1973 213 p refs Presented at the 1st Wetlands, Conf., Storrs, Conn., 20 Jun. 1973 Sponsored by Dept. of Interior
(PB-232430/9; REPT-21W74-08151;
OWRR-A-999-CONN(14)) Avail: NTIS HC $5.75 CSCL 08H

The conference, emphasizing inland wetlands, brought together experts in geology, hydrology, soils, water chemistry, floristic and faunistic biology with other ecosystems researchers and with social and political scientists, policy makers and interested laymen. They reviewed what is known on wetlands as well as the limitations of each approach. The general conclusion of this conference was that wetlands are a part of the larger ecosystem and that each worker had contrasting views and different definitions indicating the need for a holistic view of the environment. This would result in a comprehensive definition of wetlands which will be useful in developing policies for effective delineation and protection of such areas. GRA

N74-33931# Army Foreign Science and Technology Center, Charlottesville, Va.
PROGRESS IN HIGH-PRECISION LINEAR GEODETIC MEASUREMENTS
A. A. Genike, B. A. Larin, and V. M. Nazarov 2 May 1974 11 p Transl. into ENGLISH from Geod. i Kartografiya (USSR), no. 12, 1972 p 16-21
(AD-782055; FSTC-HT-23-0214-74) Avail: NTIS CSCL 08/5

A survey of the progress made in high-precision geodetic linear measurement over the past years is given. Previously, most equipment for measurement used in geodetic work was supplied by foreign firms; now, Soviet instruments have been developed. Laser equipment is now popular since it can be used at any time of the day; there is still room for improvements in accuracy, and automation will play an ever-increasing role. GRA

N74-33932# Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
NONLINEAR ROTARY WAVE ION PLASMA Final Technical Report
Bernard H. Duane and Harold B. Liemohn May 1974 50 p refs
(Contract N00014-73-C-0333; ARPA Order 2141)
(AD-782257) Avail: NTIS CSCL 04/1

The interaction between a rotary electromagnetic plane wave propagating along an axial magnetic field and an arbitrary phase-space distribution of charged particles is solved exactly for selected cases. The interaction is described by the nonlinearly coupled Vlasov-Maxwell ion-plasma field equations which are integrated with the assistance of four new constants of the motion. The ion orbits in momentum space are bipolar double periodic eigenfunctions of ion proper time, which are obtained in closed form as the difference between two doubly quasi-periodic Weierstrass zeta functions. The ion orbits in position space are helical-spiral doubly quasi-periodic functions of ion proper time, expressible simply in the terms of doubly quasi-periodic Weierstrass sigma functions. (Modified author abstract) GRA

N74-33933# Stanford Research Inst., Menlo Park, Calif.
PROCEEDINGS OF THE PRAIRIE SMOKE 5 RF MEASUREMENTS DATA WORKSHOP
P. A. Fialer Mar. 1974 181 p refs Workshop held at Menlo Park, Calif., 8-9 Nov. 1973
(Contract N00014-70-C-0413; ARPA Order 1656; NR Proj. 088-047)
(AD-782276) Avail: NTIS CSCL 04/1

Project PRAIRIE SMOKE is a series of coordinated field experiments investigating the effects of HF heating on the ionosphere. These proceedings describe results from various experiments conducted during the PRAIRIE SMOKE 5 test series. PRAIRIE SMOKE was carried out during the period 10 September to 10 October 1973. Its primary purpose was to collect data regarding the efficiency of ionospheric heating, including the dependences of the various observable effects of heating on the frequency, power, and modulation of the heater. (Modified author abstract) GRA

N74-33934# Rivkin/Carson, Inc., Washington, D.C.
STATE INTERVENTION FOR ENVIRONMENTAL QUALITY Final Report
Jun. 1973 38 p refs
(Contract H-2095)
(PB-232286/5; HUD-PDR-001a) Avail: NTIS HC $5.00 CSCL 13B

This report examines the various legislation for environmental protection and land use control recently enacted by many states. The need, advantages and disadvantages of this is discussed. Also, the impact of Federal legislation on states to set-up their own controls is analyzed in terms of some initial Federal legislation and where it has led the states. GRA

N74-33935# Army Foreign Science and Technology Center, Charlottesville, Va.
THE PROSPECTS OF ADOPTION OF NEW HIGH PRECISION TECHNOLOGY IN THE TOPOGRAPHIC-GEODESIC INDUSTRY
M. G. Gerasimenko 19 Mar. 1974 7 p refs Transl. into ENGLISH from Geod. i Kartografiya (USSR), no. 9, Sep. 1969 p 8-11
(AD-781935; FSTC-HT-23-1079-72) Avail: NTIS CSCL 08/2

The growing demand of the national economy and national defense for topographic-geodesic data requires a constant increase in the production of new geodesic and photogrammetric instruments and equipment, and also an increase in labor productivity on the basis of the extensive adoption of new technology and computer systems. The article is a report on several new high-precision geodesic and photogrammetric instruments and devices that will find industrial application in the near future. GRA

N74-33936# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
THE EFFECT OF ARTIFICIAL IONOSPHERIC HEATING ON PARTIAL REFLECTIONS Scientific Report
William A. Kissick 1 Apr. 1974 131 p refs
(Contract N00014-67-A-0385-0014; Grant NSF GA-13885)
(AD-781954; PSU-IRL-SCI-422) Avail: NTIS CSCL 04/1

The work describes several theories that make use of a radio wave partially reflected from the D-region of the earth's ionosphere. Firstly, a new form of pulsed wave interaction experiment is proposed, which uses a probing wave that is partially reflected within a region heated by an independent ground-based high-power RF source. Secondly, the effects of self-heating on the usual partial reflection experiment are examined. Lastly, an analytical electron density synthesis technique is presented for the partial reflection experiment. This reduction method is based on volume reflection theory and makes use of only ordinary mode data. (Modified author abstract) GRA

N74-33937# Wayne State Univ., Detroit, Mich. Dept. of Chemical Engineering.
ANALYTICAL AND LABORATORY STUDIES ON UPPER ATMOSPHERIC ENERGY TRANSFER PROCESS Final Report, 15 Jul. 1970 - 15 Jul. 1973
Ralph H. Kummler, Esmail Jamshidi, Barbara Krieger, Demetrias P. Lalas, and Edward R. Fisher Aug. 1973 122 p refs
(Contract F19628-70-C-0284; AF Proj. 8658)
(AD-782101; AFCRL-TR-73-0605) Avail: NTIS CSCL 07/4

The vibrational temperature of N2 in the E and F regions of the atmosphere has been calculated. Excitation processes included O(singlet D) quenching by N2, N+NO, and electron-N2 collision. Loss processes included vibration-vibration exchange to CO2, vibration-translation energy transfer by oxygen atoms and diffusion. The Shimazaki-Keneshea code was used. The rate of dissociation of oxygen molecules was calculated including vibration-vibration and vibration-translation processes and comparison to experimental data was made. Chemiluminescence was observed for H+NO2, O+C2H4 and CO+OH systems in the visible and near infrared regions using a discharge flow system. The vibrational temperature of N2 was measured using an electron beam with and without CO. (Modified author abstract) GRA

N74-33938# North Carolina State Univ., Raleigh. Dept. of Geosciences.
DETECTION AND ANALYSIS OF SYNOPTIC-SCALE PERIODICITIES IN ROCKETSONDE DATA Final Report
Gerald F. Watson and Walter J. Saucier Nov. 1973 47 p refs
(Contract DAAD07-72-C-0260)
(AD-782358) Avail: NTIS CSCL 04/2

In order to examine the synoptic-scale time variability (oscillation periods of 2 to 6 days) in the zonal and meridional wind components and in the temperature at altitudes 25 to 60 km, a computer program for wave period analysis was devised and applied to rocketsonde data of the Meteorological Rocket Network. The method consisted of fitting sinusoidal waveforms of various periods and phases to data in biweekly periods and evaluating the goodness of fit. Simple mathematical considerations and results from numerous tests with hypothetical data for idealized oscillations of known characteristics showed that the axis of symmetry and amplitude of the wave to be fitted to the data could be represented by the monthly mean and the square root of 2 times the standard deviation of the daily values, respectively. Aliasing effects would be minimized as long as

there were at least 12 observations during the month. (Modified author abstract) GRA

N74-33939# Colorado School of Mines, Golden.
ROCK DISCRIMINATION BY MULTIBAND PHOTOGRAPHY Final Report, 1 Apr. 1971 - 30 Jun. 1974
Gary L. Raines and Keenan Lee 30 Jun. 1974 7 p refs
(Grant DA-ARO(D)-31-124-71-G101; Grant DA-ARO(D)-31-124-73-G88)
(AD-782190; AROD-9843.4-EN) Avail: NTIS CSCL 08/7

When making geologic interpretations of aerial photography the most significant recognition elements are texture, pattern, association of features, and tone (or color); lesser recognition elements are shape and size. Tone is an important aspect of all the recognition elements, since by tone these other recognition elements are used. The research reported upon here is an evaluation of the concept that tonal differences between formations on aerial photography can be improved through the selection of the appropriate spectral bands. (Modified author abstract) GRA

N74-33940# Naval Weapons Lab., Dahlgren, Va.
THE SIMULATION OF A GRAVITATIONAL FIELD WITH A POINT MASS MODEL
James C. Perry and John Pinker, Jr. Jul. 1974 46 p refs
(AD-782578; NWL-TR-3158) Avail: NTIS CSCL 08/5

The authors compute a point mass representation of an artificial model of the earth's anomalous gravitational field a scaled version of the (8,4) solid spherical harmonic which is even in longitude. (Modified author abstract) GRA

N74-33941# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PRINCIPLES OF EXPANSION OF AN AEROSOL STREAM IN A TURBULENT FLOW
A. V. Tkachenko and V. T. Kolezhuk 20 Jun. 1974 14 p refs Transl. into ENGLISH from Ukr. Issled. Gidro-Meteorol. Inst., Tr. (USSR), no. 99, 1971 p 3-10
(FTD Proj. T74-03-07)
(AD-782530; FTD-HC-23-1563-74) Avail: NTIS CSCL 04/1

The article attempts to determine the possibility of interpreting experimental data on expansion of an aerosol stream from a stationary source on the basis of turbulent diffusion in the atmosphere which has led to a fuller explanation of the experimental principles of relative diffusion from an instantaneous source. GRA

N74-33942# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
THE DETERMINATION OF DIFFUSION COEFFICIENTS IN A SHEARING FLOW BY CHEMICAL TRACER TECHNIQUES Interim Report
Antonio F. Quesada and Malcolm A. MacLeod 17 Jul. 1973 10 p refs
(AF Proj. 7635)
(AD-782617; AFCRL-TR-73-0413) Avail: NTIS CSCL 04/2

A practical technique has been developed for obtaining scalar diffusion coefficients and local wind shears from photographic observations of chemical tracer puffs deposited in the atmosphere. Analytic solutions have been obtained which indicate that the puff density is a Gaussian function of space at each time for the practically important case of an atmosphere possessing constant scalar diffusion coefficient with a horizontal wind field having constant vertical shear. It is shown that the sum of the Gaussian half-widths squared projected on the film plane is a cubic polynomial in the time with coefficients that depend on the geometry, the shears and the diffusion coefficient, whence these parameters can be determined experimentally by a least squares fitting procedure. The technique has been tested by application to a recent experiment in the lower thermosphere. The results of this test are presented and compared with results derived earlier by the use of conventional techniques.
Author (GRA)

N74-33545 Royal Norwegian Air Force, Oslo.
SNOW AVALANCHES
R. A. Grimsrud *In* AGARD The Physiol. of Cold Weather Survival Jun. 1974 p 95-96 (For availability see N74-33534 23-04)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N74-33943*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A HOLOGRAPHIC MOTION PICTURE CAMERA Patent Application
Robert L. Kurtz, inventor (to NASA) Filed 17 Sep. 1974 13 p
(NASA-Case-MFS-22517-1; US-Patent-Appl-SN-506804) Avail: NTIS HC $4.00 CSCL 14E

A holographic motion picture camera for producing three dimensional images was disclosed. The camera employs an elliptical optical system and a motion compensator is present in one of the beam paths; the compensator allows the camera to photograph fast moving objects. NASA

N74-33944*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HALL EFFECT MAGNETOMETER Patent Application
John A. Woollam, Harry A. Beale (Md. Univ.), and Ian L. Spain, inventors (to NASA) (Md. Univ.) Filed 13 Dec. 1973 8 p
(NASA-Case-LEW-11632-3; US-Patent-Appl-SN-424590) Avail: NTIS HC $4.00 CSCL 14B

A magnetometer utilizing a single crystal of Bi2Se3 having a rhombohedral crystal structure is described along with a method for making such a device. The Bi2Se3 has a positive or negative Hall coefficient and a carrier concentration of about 10 to the 18th power to 10 to the 20th power per cubic centimeter. NASA

N74-33945*# Systems Research Lab., Champaign, Ill.
RESEARCH STUDY ON STABILIZATION AND CONTROL MODERN SAMPLED-DATA CONTROL THEORY Bimonthly Report
B. C. Kuo and G. Singh 10 Sep. 1974 63 p refs
(Contract NAS8-29853)
(NASA-CR-120455) Avail: NTIS HC $6.25 CSCL 20F

The methods of continuous and discrete describing function analysis were applied to predicting the existence of self-sustained oscillations in the single-axis model of the large space telescope system with nonlinear control moment gyroscope friction characteristics. It is shown that the stability equations may be solved by a numerical-iterative technique using the describing function analysis, instead of the usual graphical methods. The numerical method is found to be effective in leading to a convergent solution rapidly, with an appropriate guess of the initial condition. Author

N74-33946*# Scientific Translation Service, Santa Barbara, Calif.
PHOTOGRAPHIC METHODS FOR DETERMINATION OF DROPLET SIZE SPECTRA
G. Jandl and O. Bell Washington NASA Sep. 1974 27 p refs Transl. into ENGLISH from Brennst. - Waerme--Kraft (West Germany), v. 28, no. 7, Jul. 1972 p 313-319
(Contract NASw-2483)
(NASA-TT-F-15948) Avail: NTIS HC $4.50 CSCL 14E

Drop spectra arising from oil atomization were measured using short-time flash photography. The method raises problems in illuminating technology, primarily because light intensities from spark flash equipment decrease with shorter flash times. A photographic system is proposed which makes possible short-time photography of droplets with continuous light. Author

N74-33947*# Scientific Translation Service, Santa Barbara, Calif.
CONSTRUCTION AND CALIBRATION OF A NEUTRON SPECTROMETER IN THE ENERGY RANGE OF 10-50 MeV
I. Boehm, J. Boehm, and G. Wibberenz Washington NASA Sep. 1974 26 p refs Transl. into ENGLISH from Atomkernenergie (West Germany), v. 21, no. 1, 1973 p 48-54
(Contract NASw-2483)
(NASA-TT-F-15931) Avail: NTIS HC $4.50 CSCL 14B

The construction and calibration of a neutron spectrometer for measuring solar neutrons is described. A simple circuit is given for electronic separation of gamma rays and neutrons. It is concluded that the inelastic interactions of neutrons with energy of 18 MeV and more with carbon atoms can not longer be neglected in the NE 213 scintillator used for neutron detection. Author

N74-33948# Advisory Group for Aerospace Research and Development, Paris (France).
AGARD FLIGHT TEST INSTRUMENTATION SERIES. VOLUME 6: OPEN AND CLOSED LOOP ACCELEROMETERS
I. McLaren (RAE), W. D. Mace, ed., and A. Pool, ed. Jul. 1974 46 p refs
(AGARD-AG-160-Vol-6; AGARDograph-160-Vol-6) Avail: NTIS HC $5.50

The state-of-the-art of both open and closed loop accelerometers used for aircraft flight test work, covering system and component analysis and basic hardware design is discussed. Both physical design problems and mathematical analysis are covered and special emphasis is put on those aspects likely to be relevant to aircraft flight test work. Performance details include repeatability, compensation for temperature variation, insusceptibility to cross effects, stability under vibration and frequency response. The application of accelerometers in several flight test techniques together with their performance requirements are reviewed in order to guide the flight test engineer in making his choice of instrument in any particular case. The principles of frequency response tests are discussed in association with the theoretical characteristics of various, nominally, second order systems which are modified either by the method of testing or by the inherent, practical difficulties of instrument design. Author

N74-33949*# Stanford Univ., Calif. Microwave Lab.
INFRARED DIFFERENTIAL ABSORPTION FOR ATMOSPHERIC POLLUTANT DETECTION Semiannual Report, Mar. - Sep. 1974
R. L. Byer Oct. 1974 104 p refs
(Grant NSG-1012)
(NASA-CR-140400; ML-2357) Avail: NTIS HC $8.25 CSCL 14B

Progress made in the generation of tunable infrared radiation and its application to remote pollutant detection by the differential absorption method are summarized. It is recognized that future remote pollutant measurements depended critically on the availability of high energy tunable transmitters. Futhermore, due to eye safety requirements, the transmitted frequency must lie in the 1.4 micron to 13 micron infrared spectral range. Author

N74-33950*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
DEVELOPMENT AND TESTING OF LASER DOPPLER SYSTEM COMPONENTS FOR WAKE VORTEX MONITORING. VOLUME 1: SCANNER DEVELOPMENT, LABORATORY AND FIELD TESTING AND SYSTEM MODELING
D. J. Wilson, M. C. Krause, E. W. Coffey, C.-C. Huang, B. B. Edwards, K. R. Shrider, J. L. Jetton, and L. K. Morrison Aug. 1974 190 p
(Contract NAS8-29824)
(NASA-CR-120466; LMSC-HREC-TR-D390159-1-Vol-1) Avail: NTIS HC $12.50 CSCL 14B

A servo-controlled range/elevation scanner for the laser Doppler velocimeter (LDV) was developed and tested in the field to assess its performance in detecting and monitoring aircraft trailing vortices in an airport environment. The elevation scanner provides a capability to manually point the LDV telescope at operator chosen angles from 3.2 deg. to 89.6 deg within 0.2 deg, or to automatically scan the units between operator chosen limits at operator chosen rates of 0.1 Hz to 0.5 Hz. The range scanner provides a capability to manually adjust the focal point of the system from a range of 32 meters to a range of 896 meters under operator control, or to scan between operator chosen limits and at rates from 0.1 Hz to 6.9 Hz. The scanner controls are designed to allow simulataneous range and elevation scanning so as to provide finger scan patterns, arc scan patterns, and vertical line scan patterns. The development and testing of the unit is discussed, along with a fluid dynamic model of the wake vortex developed in a laser Doppler vortex sensor simulation program. Author

N74-33951*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
DEVELOPMENT AND TESTING OF LASER DOPPLER SYSTEM COMPONENTS FOR WAKE VORTEX MONITORING. VOLUME 2: SCANNER OPERATIONS MANUAL
B. B. Edwards and E. W. Coffey Aug. 1974 92 p
(Contract NAS8-29824)
(NASA-CR-120467; LMSC-HREC-TR-D390159-2-Vol-2) Avail: NTIS HC $7.75 CSCL 14B

The theory and operation of the scanner portion of the laser Doppler system for detecting and monitoring aircraft trailing vortices in an airport environment are discussed. Schematics, wiring diagrams, component values, and operation and checkout procedures are included. Author

N74-33952*# Scientific Translation Service, Santa Barbara, Calif.
SPACE RESEARCH APPARATUS
Yu. K. Khodarev, V. V. Shatrovskiy, B. N. Andreyanov, B. N. Rodionov, P. Ye. Elyasberg, and V. S. Etkin Washington NASA Aug. 1974 191 p refs Transl. into ENGLISH from the book "Apparatura dlya Kosmicheskikh Issledovaniy" Moscow, Nauka Press, 1973 118 p
(Contract NASw-2483)
(NASA-TT-F-15677) Avail: NTIS HC $12.75 CSCL 14B

A broad range of questions associated with theoretical analysis and design of equipment used in conducting space experiments are encompassed. The information on theoretical analysis of the possible apparatus solutions used to generate information streams aboard spacecraft is covered. The articles on coding methods reflect the urgent necessity for more sophisticated onboard processing of the information obtained. The problems of spacecraft antenna testing and radiometric equipment are examined. Author

N74-33953*# Conrac Corp., Durate, Calif. Instrument/Controls Div.
ABSOLUTE PRESSURE TRANSDUCERS FOR SPACE SHUTTLE AND ORBITER PROPULSION AND CONTROL SYSTEMS Final Engineering Report
J. J. Bolta 14 Jun. 1974 152 p
(Contract NAS8-27442)
(NASA-CR-120473; FER-4715-98) Avail: NTIS HC $10.75 CSCL 14B

A preliminary design was completed, reviewing of such subjects as: the trade studies for media isolation and one sensor vs. two sensors for two bridges; compensation resistors; unit design; hydrogen embrittlement; sealing techniques and test station design. A design substantiation phase was finished, consisting of testing of a prototype unit and fabrication technique studies. A cryogenic test station was implemented and prototype sensor cells were fabricated, sensors assembled, and cryogenic tests performed. Author

N74-33954*# Westinghouse Electric Corp., Elmira, N.Y. Electronic Tube Div.
ENVIRONMENTAL TEST REPORT FOR THE WX-32335 SEC CAMERA TUBE
R. J. Malanoski Oct. 1973 27 p
(Contract NSR-31-001-286)
(NASA-CR-140444) Avail: NTIS HC $4.50 CSCL 14E

The environmental testing activity on the WX-32335 was carried out to determine if this tube type could withstand the environmental requirements established for the International Ultraviolet Explorer (IUE) camera tube (WX-32224). The results of the tests led to the following conclusions: (1) The WX-32335 as processed with a CsTe photocathode surface can withstand the temperature extremes established for the IUE camera tube without damage to the photocathode surface or without introducing background signal in the tube after one hour of dark integration. (2) The WX-32335 built with a WX-32224 type target support structure can withstand the sinusoidal vibration requirements established for the IUE camera tube. (3) Although the vibration test of the WX-32335 type tubes built with the flat target ring structure could not be completed, there was no indication that these tubes could not withstand the sinusoidal

vibration requirements established for the IUE camera tube.
Author

N74-33955# United Kingdom Atomic Energy Authority, Harwell (England).
INFRA-RED BURN-OUT DETECTOR
D. N. Benn and R. A. W. Shock Feb. 1974 10 p refs
(AERE-R-7338) Avail: AEC Depository Libraries HC $4.00; HMSO 50p; BIS $2.15

An infrared burnout detector intended as a safety device for heat transfer experiments is described. Use has been made of a commercial infrared pyrometer and a purpose-built voltage level detector and trip circuit. Details of the electronic circuit, the time response and sensitivity are given. Author (NSA)

N74-33956# Sandia Labs., Albuquerque, N.Mex.
INTRINSIC THERMOCOUPLE RESPONSE
N. R. Keltner 1974 6 p refs Presented at the 20th Instrumentation Symp., Albuquerque, N. Mex., 21 May 1974 Sponsored by AEC
(SLA-74-5084; Conf-740504-4) Avail: NTIS HC $4.00

Analytical and finite difference methods for obtaining the response of an intrinsic thermocouple to transient substrate temperatures are described. The usefulness of these response models is illustrated by example applications in which temperature measurement errors are estimated and in certain cases corrected. NSA

N74-33957# Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf.
MATERIAL ANALYSIS WITH A NEW HIGH CURRENT SECONDARY ION MASS SPECTROMETER
F. Pichlmayer Feb. 1974 24 p refs In GERMAN
(SGAE-2242) Avail: NTIS HC $4.25

A secondary ion mass spectrometer for material and concentration profile analysis has been developed and built. It consists of a duoplasmatron ion source with primary beam formation system, target changer, secondary ion energy selector, and quadrupole mass filter. Mass resolution, dynamic range and transmission, of the secondary ion analyzer were investigated comparing thermal and sputter ion detection. Material analysis of several standards and samples and concentration profile measurements of implanted Cs into SiC are made by means of this apparatus. Author (NSA)

N74-33958# Lund Univ. (Sweden). Fysiska Inst.
VIDICON NUCLEAR TRACK PHOTOMETER
Sten VonFriesen Feb. 1974 40 p
(LUIP-CR-74-2) Avail: AEC Depository Libraries HC $5.00

A nuclear track photometer which has been developed at the Department of Cosmical High Energy Physics at the University of Lund is described. It consists of a Type B Leitz microscope with a Nikon camera adapter, where the image of the track is viewed by a Vidicon tube of a Philips type EL 8000 compact TV-camera. The camera has been slightly modified to bring out the video signal before the addition of the synchronization pulses. The vertical and horizontal pulses are brought roug separately. The adjustment and focusing of the image are made by means of a TV monitor. Author (NSA)

N74-33959# Kernforschungsanlage, Juelich (West Germany).
MOVI-3D, A PLOT-PROGRAM FOR 3 DIMENSIONAL REPRESENTATION OF KINETIC PROCESSES IN 16 MM-FILMS
S. Boumans and A. Lauer Dec. 1973 51 p refs In GERMAN
(JUL-1029-RG) HC $5.75

The documentation for MOVI-3D contains the utilization instruction, the input description, technical informations about the code, and an application example. The program system MOVI-3D, with the aid of microfilm plotter CALCOMP-1670, produces completely computer-made 16 mm films of evaluated kinetic processes in a general and flexible way. As input any set of matrixes may be submitted that represent snap-shots of a function of two discrete variables proceeding in time in a continuous or piece-wise continuous manner. By linear or square time interpolations, the code computes a sequence of intermediate function fields. These are then plotted as a consecutive series of pictures in a perspective three-dimensional representation on the 16mm film. The MOVI-3D film program allows for flexible direction of scenes, choice of variable projection angles and fade-overs, as well as insertion of plotted illustration text if desired. Author (NSA)

N74-33960# Programmes Analysis Unit, Chilton (England).
CURIOSITY ORIENTED RESEARCH: AN EXPERIMENTAL STUDY: X-RAY HOLOGRAPHY
R. D. Medford 1974 25 p refs
(P.A.U.M-21) Avail: AEC Depository Libraries HC $4.25

The determination of the phase of a scattered wave was investigated as a significant and formiable problem for the X-ray crystallographer. It is reported that greater penetration can be obtained with X-rays than with very high energy electron beams. It is also shown that holographic methods could be used in structure determination. M.C.F.

N74-33961# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
DESIGN OF A PIN-DIODE, NARROW BAND SPOT MICROWAVE SWITCH
David E. Meharry 1974 12 p
(S-63; ISBN-951-750-191-9) Avail: NTIS HC $4.00

The computer aided design of a narrow band, pin-diode SPDT switch, for use in a 4.75 GHz Dicke radiometer, is described. Although the example switch is constructed on microstrip, the circuit analysis and computer program description are more generally applicable. Final results were in close agreement with predicted switch behavior. Author (ESRO)

N74-33962# Osservatorio Astronomico, Rome (Italy).
ANALYSIS AND RESTORATION OF SPECTRA BY INVERSE NUMERICAL FILTERS
G. A. DeBiase and D. Trevese Nov. 1973 9 p refs Presented at the 59th Congr. Nazl. della Soc. Ital. di Fis.
(RR-12) Avail: NTIS HC $4.00

An inverse numerical filter to restore spectral data affected by the instrumental spread function is described. A linear (Wiener) filter was also applied to data to minimize the effect of noise. Fast Fourier technique routine was used to speed the numerical computations. The method was applied to a portion of the spectrum of sigma tau in the region 4017 to 4027 A, corresponding to 875 points. A reduction of noise and optimization in the spectral line position determination is emphasized. ESRO

N74-33963# Groupe de Recherches Ionospheriques, Issy-les-Moulineaux (France).
ARAKS PROJECT. HALL EFFECT MAGNETOMETER. PRELIMINARY STUDY [PROJET ARAKS. MAGNETOMETRE A EFFET HALL. ETUDE PRELIMINAIRE]
J. F. Karczewski and J. M. Moreau Jan. 1974 40 p refs In FRENCH
(GRI/NTP/124) Avail: NTIS HC $5.00

The development of a Hall effect magnetometer for mounting inside a nose cone, enabling attitude restitution, is described. Two types of Hall elements both made of InAs, were selected; the definite choice, however, depends on qualification environmental tests. The choice of the flux concentrator is discussed. Possible electrical and mechanical mountings for both elements are described. A preliminary test of one of the Hall element magnetometers shows the usefulness of this type of sensor in an experiment in which electromagnetic interference should be as small as possible. ESRO

N74-33964# DSM/nv Nederlandse Staatsmijnen, Geleen. Central Lab.
CONSTRUCTION AND APPLICATION OF A LOW-SPEED CENTRIFUGE FOR THERMODYNAMIC INVESTIGATION OF MACROMOLECULAR SYSTEMS
B. J. Rietveld 1 Oct. 1973 18 p refs
(MS-1023-CL; NIC-1) Avail: NTIS HC $4.00

A description is given of the design, construction and application of a 0-2000 rpm centrifuge for studying liquid-liquid phase separations in macromolecular systems at temperatures of 0-200 C. The concentrations in the phases can be measured with the aid of the complete optical schlieren system of the Model-E Spinco-Ultracentrifuge. Owing to the low rotational

speed, sedimentation-velocity and sedimentation-diffusion equilibrium measurements can be carried out also in solutions containing macromolecules of very high molecular weight.
Author (ESRO)

N74-33965# Royal Netherlands Meteorological Inst., De Bilt.
WIND VELOCITY CALIBRATION IN THE KNMI WIND TUNNEL [WINDSNEUHEIDSIJKING IN DE KNMI-WINDTUNNEL]
A. G. M. Driedonks 1974 30 p refs In DUTCH
(KNMI-V-253) Avail: NTIS HC $4.50

The equipment used for wind velocity measurement in the KNMI wind tunnel was calibrated in view of displacement of the wind tunnel. Four cup anemometers and three trivanes were used for this investigation. These instruments were calibrated accurately in the wind tunnel against wing wheel, and old and new pitot tubes. They were then transported to another low speed wind tunnel where calibration took place with a pitot tube, and returned. Results of this program are reported. The cup anemometers and trivanes will be used for future calibrations.
ESRO

N74-33966# Royal Netherlands Meteorological Inst., De Bilt.
A FAST SPRAY-PROOF ANEMOMETER
W. A. Oost 1974 15 p refs
(KNMI-WR-74-5) Avail: NTIS HC $4.00

Results are presented of the development of a fast responding three-dimensional anemometer of small dimensions, resistant to spray, salt-accretion and rain. During the first step of the development of an air-sea interaction program, it was realized that all commercially available wind sensors have their short comings when used in the marine atmosphere in the proximity of waves. The anemometer working principle is either based on measuring pressure or velocity difference. The advantages of the instrument are that: it is small, fairly fast, rugged, three-dimensional, has no moving parts, and is self-cleaning.
ESRO

N74-33967# Thermo-Systems, Inc., St. Paul, Minn.
STATE OF THE ART: 1971 INSTRUMENTATION FOR MEASUREMENT OF PARTICULATE EMISSIONS FROM COMBUSTION SOURCES. VOLUME 4: EXPERIMENTS Final Report
Gilmore J. Sem and John A. Borgos Sep. 1973 123 p refs
(Contract EPA-CPA-70-23)
(PB-231919/2; EPA-650/2-73-022) Avail: NTIS HC $9.25 CSCL 14B

The second phase was an experimental evaluation of the most promising technique: beta radiation attenuation. Section 2 describes early laboratory tests performed with the sensing head of a Gelman beta radiation instrument. Section 3 describes a sampling facility, designed specifically for the evaluation of the instruments which measure particle mass concentration of stack effluent. Section 4 describes results of the calibration of the sampling facilities in the field experiment station under several normal operating conditions. Section 5 describes tests of two prototype instruments with beta radiation particle mass sensors. The highly encouraging measurements indicate that the beta radiation sensing with filter collection of particles is a strong candidate for the measurement of particle mass concentration in smoke stacks. Section 6 presents candid comments regarding the state-of-the-art of commercial transmissometers in January 1971.
GRA

N74-33968# Army Foreign Science and Technology Center, Charlottesville, Va.
METHOD OF APPRAISAL OF ERRORS AND POSSIBILITES OF THE ELECTROTHERMOANEMOMETER
E. P. Dyban and E. Ya. Epik 1 May 1974 10 p refs Transl. into ENGLISH from Izv. Sib. Otd. Akad. Nauk. SSSR (USSR), no. 8, 1970 p 26-31
(AD-781239; FSTC-HT-23-2308-72) Avail: NTIS CSCL 14/2

The use of electrothermal anemometers for measuring flow characteristics is discussed. Causes of errors in such measurements are analyzed. Experiments show that error in the thermoanemometric method of measuring velocity and its turbulent pulsations mainly depends on errors in the calibration characteristics of the anemometers. Suggestions for preparing the calibration characteristics are given and the effect of various parameters, such as the position of anemometer legs and support with respect to flow direction, on the calibration characteristics of anemometers is discussed.
GRA

N74-33969# Radio Corp. of America, Burlington, Mass. Advanced Technology Labs.
HOLOGRAPHIC HORIZONTAL DISPLAY SYSTEM Final Report, 1 Mar. 1973 - 28 Feb. 1974
Gardner T. Burton, Burton R. Clay, Richard F. Croce, Douglas A. Gore, and Louis A. Perretta Jun. 1974 108 p refs
(Contract N62269-73-C-0609)
(AD-781337) Avail: NTIS CSCL 14/5

Program goals were: (1) to extend the Holographic Moving Map Display Technology, (2) to improve the performance of the display and transport system, (3) to simplify the holographic recording processes, and (4) to develop the capability for presenting horizontal situation information, alphanumeric, graphical and continuous-tone sensor data for display with moving map data. During the course of the program, a new holographic recording facility was established for recording of large format, high quality focused-image holograms, and the technique for recording butted holograms was refined, allowing the implementation of a greatly simplified recording system. Improved hardware was assembled for the recording of address and registration holograms that are required for rapid access of the recorded image holograms when the holograms are pressed on extended length display tape strips. (Modified author abstract)
GRA

N74-33970# Stanford Univ., Calif. Guidance and Control Lab.
STUDY TO DEVELOP GRADIOMETER COMPENSATION TECHNIQUES Final Report, 1 Feb. 1973 - 31 Jan. 1974
Daniel B. DeBra and Eugene J. Pelks Feb. 1974 75 p refs
(Contract F19628-73-C-0172; AF Proj. 7600)
(AD-781805; AFCRL-TR-74-0114) Avail: NTIS CSCL 14/2

The primary goal of the gravity gradiometer (GG) research effort at Stanford University has been to establish the feasibility of operation of a GG in a closed loop mode. A parameter estimation technique will allow for online modification (compensation) of the sensor output signal as well as for trimming of pertinent sensor physical properties so as to improve instrument performance. Gravity gradiometers are required to operate with an accuracy of E.U. This is so demanding that closed loop mode operation may be essential. Although attention has been focused exclusively upon the Hughes rotating gravity gradiometer (RGG), the parameter estimation method developed is applicable, in principle, to any instrument subject to dynamically induced errors.
Author (GRA)

N74-33971# Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
FLAME CHARACTERIZATION PROBES Final Report
R. C. Kesselring, K. M. Gorji, W. S. Young, W. E. Rodgers, and E. L. Knuth Mar. 1974 186 p refs
(Contract EPA-68-02-0628)
(PB-232287/3; EPA-650/2-74-023) Avail: NTIS HC $12.50 CSCL 14B

The report gives results of work dealing with the problem of extracting temperature, species concentration, and velocity data from flames. A literature review was conducted to determine the state-of-the-art for making the following measurements in a particulate-laden flame environment: flame temperature--1100 to 2500C; stable chemical species--NO, H2, O2, CO, SO2, CO2, N2, NO2, and Ar: unstable chemical species--O, N, OH, H, and other flame intermediates: and velocity--magnitude and direction. Based on results of the literature review, three separate probes were designed and fabricated to make these measurements. In order to measure the unstable species and also to provide a calibration reference for the stables species and temperature, a molecular beam mass spectrometer equipped with a time-of-flight chopper was used.
GRA

N74-33972# GCA Corp., Bedford, Mass. Technology Div.
OPTICAL CORRELATION TECHNIQUES Interim Report
Arthur Engelman and Andrew Tomlinson Jun. 1974 20 p refs
(Contract DAAH01-74-C-0500; ARPA Order 2656)

(AD-782265) Avail: NTIS CSCL 07/4

The design of a radiometric experiment is described which provides a laboratory model for implementation of the optical correlation technique. The radiometer has provision for alternately viewing the source directly and through a gas absorption cell. The source may be characterized either by unstructured continuum or by specific molecular emission. Optimization of the gas cell parameters (temperature, pressure, etc.) is sought for maximum discrimination between molecular and blackbody emission. The cell is 10 centimeters in length and may be operated up to two atmospheres in pressure. A double pass may be made by the replacement of one end window with a mirror. The detector bandpass is limited by optical filtering. The desirability of an advanced molecular absorption band model for highly non-isothermal paths and further absorption-emission spectraradiometric data are discussed. Author (GRA)

N74-33973# Army Foreign Science and Technology Center, Charlottesville, Va.

IMPROVEMENT OF RELIABILITY AND ACCURACY OF RECOGNITION OF IDENTIFICATION MARKS ON AERIAL PHOTOGRAPHS

Yu. K. Chervinskii 12 Apr. 1974 8 p Transl. into ENGLISH from Geod. i Kartografiya (USSR), no. 4, 1973 p 56-59

(AD-782004; FSTC-HT-23-0273-74) Avail: NTIS CSCL 08/2

There is need for the improvement of reliability and accuracy of identification marks during aerial photographic surveys. Stereoscopic images of ground photographs reduce the need for extensive laboratory work. Objects which will last must be chosen for identification marks, so that they may be used again when revising maps. GRA

N74-33974# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div

HELIUM SELF-OSCILLATING MAGNETOMETER UTILIZING OPTICAL PUMPING OF He4 ATOMS

R. A. Zhitnikov, P. P. Kuleshov, N. A. Dovator, and V. A. Azin 26 Jun. 1974 11 p refs Transl. into ENGLISH from Geofiz. App. (USSR), no. 50, 1972 p 5-9

(FTD Proj. T74-01-19)

(AD-782086; FTD-HT-23-1174-74) Avail: NTIS CSCL 14/2

Quantum magnetometers with optical pumping of alkaline metal pairs and metastable atoms of He4 find increasingly wide application in measuring various parameters of the geomagnetic field. These magnetometers can be constructed on a circuit with an automatic frequency control of the external (reference) generator towards the center of the resonance line of the working medium or on an auto-oscillating circuit using a spin generator (self-oscillating magnetometer). The self-oscillating magnetometers are more simple, compact, and reliable and ensure a greater speed of operation. GRA

N74-33975# Beukers (John M.) Lab., Inc., Hauppauge, N.Y.

LOW COST ALTITUDE REPORTER Annual Report, 1 Mar. 1973 - 24 Mar. 1974

Richard A. Bova 24 Mar. 1974 51 p refs

(Contract N00014-73-C-0292; NR Proj. 213-115)

(AD-781895) Avail: NTIS CSCL 01/4

The goal of the program is to develop a low cost Mode C encoding altitude reporter. Two types of pressure transducers for use in the reporter are discussed; an aneroid barometric capsule and a piezo resistive integrated circuit. Several methods of interfacing these devices are analyzed and the results of testing breadboard models are shown. The tasks remaining to complete the program are also discussed. (Modified author abstract) GRA

N74-33853 Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE PICTURE PROCESSING SYSTEM GRAFIX 1 [DAS BILDVERARBEITUNGSSYSTEM GRAFIX 1]

Klaus Woelcken *In its* Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 65-74 refs In GERMAN; ENGLISH summary (For availability see N74-33846 23-13)

N74-33870 Joint Publications Research Service, Arlington, Va.

NOISE COMPENSATION IN THE BODY OF THE COMPONENT MAGNETOMETER SENSORS

E. Ye. Reznik *In its* Geophys. Equipment (JPRS-62915) 9 Sep. 1974 p 24-28 refs Transl. into ENGLISH from the book "Geofizicheskaya Apparatura" Leningrad, Izd. Nedra, 1973 p 23-27 (For availability see N74-33867 23-13)

N74-33871 Joint Publications Research Service, Arlington, Va.

INCREASING THE NOISE PROOFNESS OF A NUCLEAR PRECESSION MAGNETOMETERS

B. I. Bashchenko and V. I. Myukhkyurya *In its* Geophys. Equipment (JPRS-62915) 9 Sep. 1974 p 29-33 refs Transl. into ENGLISH from the book "Geofizicheskaya Apparatura" Leningrad, Izd. Nedra, 1973 p 27-30 (For availability see N74-33867 23-13)

N74-33996* Joint Publications Research Service, Arlington, Va.

HOLOGRAPHY AND THE CONTROL OF SELF-PROPELLED VEHICLES

V. I. Yeroshin, G. P. Novikov, V. M. Busargin, and T. I. Kurmanaliyev *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 111-142 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 30 p (For availability see N74-33976 23-15)

CSCL 14E

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N74-33976*# Joint Publications Research Service, Arlington, Va.

TECHNOLOGY FOR THE PRODUCTION OF SPACE EQUIPMENT

A. V. Breslavets, ed., B. N. Pyak, ed., V. V. Shcherbakov, ed., and D. G. Gryunvald, ed. Washington NASA Sep. 1974 146 p refs Transl. into ENGLISH of the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 p 1-134

(NASA Order W-13183)

(NASA-TT-F-15766) Avail: NTIS HC $10.50 CSCL 13H

Experimental design, production planning, and manufacturing processes for space research equipment and instruments are discussed. For individual titles, see N74-33977 through N74-33996.

N74-33977* Joint Publications Research Service, Arlington, Va.

CHARACTERISTIC FEATURES OF DETERMINING THE LABOR INPUT AND ESTIMATED COST OF THE DEVELOPMENT AND MANUFACTURE OF EQUIPMENT c34

T. I. Kurmanaliyev and A. V. Breslavets *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 3-10 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 8 p (For availability see N74-33976 23-15)

CSCL 05C

The difficulties in obtaining exact calculation data for the labor input and estimated cost are noted. The method of calculating the labor cost of the design work using the provisional normative indexes with respect to individual forms of operations is proposed. Values of certain coefficients recommended for use in the practical calculations of the labor input for the development of new scientific equipment for space research are presented. Author

N74-33978* Joint Publications Research Service, Arlington, Va.

PERT SIMULATION OF EXPERIMENTAL DESIGN WORK c34

T. I. Kurmanaliyev and A. S. Pishchulin *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 11-14 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press,

1974 4 p (For availability see N74-33976 23-15)
CSCL 05A

The basic principles of constructing the models and rules for their application in the development of PERT charts are discussed. Author

N74-33979* Joint Publications Research Service, Arlington, Va.
MULTITOPIC LOAD CHART FOR THE DESIGN OFFICE SUBDIVISON **c34**
A. S. Pishchulin *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 15-20 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 6 p (For availability see N74-33976 23-15)
CSCL 05A

The methods of development, designation and application of the charts under multitopic conditions are considered. Author

N74-33980* Joint Publications Research Service, Arlington, Va.
ORGANIZATION OF OPERATIONS WITH RESPECT TO CHECKING DRAWINGS (DRAWING CHECKING PROCEDURE) **c34**
L. M. Greys and S. G. Namestnik *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 21-24 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 4 p (For availability see N74-33976 23-15)
CSCL 14D

One of the basic conditions of high quality manufacture of instruments is the error free developed design documentation. A procedure is described for organizing the design check of the drawings. Author

N74-33981* Joint Publications Research Service, Arlington, Va.
DEVELOPMENT AND PLANNING AND DESIGN OF EQUIPMENT PUMPING GENERATOR OF SEMICONDUCTOR LASERS **c16**
A. V. Popkov *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 25-30 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 6 p (For availability see N74-33976 23-15)
CSCL 17I

The schematic of a multidimensional current pulse generator is studied. A MTKh-90 cold cathode thyratron is used as the current commutator. In the autooscillation mode on a frequency of 380 hertz the generator creates a current to 100 amps per pulse in a control resistance of 1 ohm. The pulse duration is regulated within the limits from 0.1 to 3.0 microseconds. Author

N74-33982* Joint Publications Research Service, Arlington, Va.
TWO-POSITION dc PULSE VOLTAGE STABILIZER **c09**
V. I. Osadchiy *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 31-36 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 6 p (For availability see N74-33976 23-15)
CSCL 09E

The advantages of the dc pulse voltage stabilizers over the continuous action stabilizers are described. These advantages include higher efficiency, low sensitivity to the ambient temperature and insignificant size and weight. A comparison is made between the schematics of the known two position pulse stabilizer with a Schmitt trigger and that developed by the author. A characteristic feature of the improved system is the increased stabilization coefficient and the possibility of smooth regulation of the output voltage. A practical schematic is presented for the improved two position pulse stabilizer along with its parameters. Author

N74-33983* Joint Publications Research Service, Arlington, Va.
SOME CHARACTERISTIC FEATURES OF THE CONSTRUCTION OF THE AMPLIFYING CHANNEL FOR WORKING WITH SEMICONDUCTOR DETECTORS IN THE CHARGED PARTICLE ENERGY SPECTROMETER **c26**
E. I. Kuzyuta *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 37-43 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 7 p (For availability see N74-33976 23-15)
CSCL 20L

A transistorized spectrometric amplifier with a shaper is reported that selects the shape of the frequency characteristic of the amplifying channel for which the primary frequency spectrum of the signal will pass, but where the noise spectrum is limited to the maximum. A procedure is presented for selecting the shaping circuits and their inclusion principles. Author

N74-33984* Joint Publications Research Service, Arlington, Va.
SERVOSYSTEM WITH AN UNDULATORY REDUCING GEAR
A. I. Romashchenko, V. A. Samoylenko, I. A. Grishin, and Yu. S. Tatarchuk *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 44-53 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 10 p (For availability see N74-33976 23-15)
CSCL 13I

The development of a potentiometric servosystem is described that has a dc microservomotor, which is the built in drive of an undulatory reducing gear. The operation of the system and the structural design of the undulatory reducing gear are elaborated. Results are presented from analyzing some tests of various types of undulatory reducing gear generators. Author

N74-33985* Joint Publications Research Service, Arlington, Va.
STATIC dc VOLTAGE STABILIZER-CONVERTER **c09**
V. I. Osadchiy *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 54-58 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 5 p (For availability see N74-33976 23-15)
CSCL 09E

The advantages are outlined of a static dc voltage converter combining the functions of the feed voltage stabilizer simultaneously. A comparison is made between the circuits for the known static stabilizer converter and that developed by the author. A characteristic feature of the improved system is the increased stabilization coefficient, low output impedance and the possibility of smooth regulation of the output voltage. A practical diagram is presented for the improved high voltage stabilizer converter and its parameters. Author

N74-33986* Joint Publications Research Service, Arlington, Va.
SHORTWAVE TELEMETRIC SYSTEM **c07**
K. K. Valenchuk, V. V. Shcherbakov, and V. A. Yefremkin *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 59-65 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 7 p (For availability see N74-33976 23-15)
CSCL 17B

The application of frequency modulation when constructing a telemetric system in the shortwave band. The operating principles, the construction of the system and the decision making device are described and experimental data are presented. The equipment can be used on sounding balloons. Author

N74-33987* Joint Publications Research Service, Arlington, Va.
TRANSISTORIZED BLOCKING GENERATOR **c09**
A. V. Popkov *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 66-68 ref Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 3 p (For availability see N74-33976 23-15)
CSCL 09E

Test results are given for a high speed transistorized blocking generator. Author

N74-33988* Joint Publications Research Service, Arlington, Va.

PROSPECTIVE AREAS IN THE PRODUCTION TECHNOLOGY OF SCIENTIFIC EQUIPMENT FOR SPACE RESEARCH

A. V. Breslavets *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 69-76 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 8 p (For availability see N74-33976 23-15)

CSCL 13H

The average labor of individual types of operations in the percentage ratio of the total labor consumption of manufacturing scientific instruments and apparatus for space research is presented. The prospective areas in the production technology of billet, machining, mechanical assembly, installation and assembly, adjustment and regulation and testing and control operations are noted. Basic recommendations are made with respect to further reduction of labor consumption and an increase in the productivity of labor when manufacturing scientific equipment for space research. Author

N74-33989* Joint Publications Research Service, Arlington, Va.

PROCESS OF MANUFACTURING SMALL-MODULE GEARS WITH INTERNAL COUPLING

V. p. Romanenko, A. P. Steblov, and G. V. Delektorskiy *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 77-79 Transl. into ENGLISH from the book "Tekhnologiya Proizvodtva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 3 p (For availability see N74-33976 23-15)

CSCL 13I

The small module geared coupling of an undulatory transmission is considered. Versions of the manufacture of gears with internal coupling and the instruments and equipment used, are reported. Author

N74-33990* Joint Publications Research Service, Arlington, Va.

PROCESS OF MANUFACTURING GRIDS FROM WIRE LESS THAN 0.025 MM IN DIAMETER BY THE GALVANIC GROWTH METHOD

V. A. Tsyshnatiy, N. F. Yedlichko, A. A. Yemelyanov, and L. M. Frolova *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 80-83 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 4 P (For availability see N74-33976 23-15)

CSCL 13H

The process of manufacturing grids, the peculiarities of the structural design, the fittings, the requirements on the tools and work area are discussed. Author

N74-33991* Joint Publications Research Service, Arlington, Va.

METHOD OF APPLYING A MIRROR REFLECTING LAYER TO INSTRUMENT PARTS

L. G. Alkhanov, I. A. Danilova, and G. V. Delektorskiy *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 84-88 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 5 p (For availability see N74-33976 23-15)

CSCL 13H

A method follows for applying a mirror reflecting layer to the surfaces of parts, instruments, apparatus, and so on. A brief analysis is presented of the existing methods of obtaining the mirror surface and the advantages of the new method of obtaining the mirror surface by polymer casting mold are indicated. Author

N74-33992* Joint Publications Research Service, Arlington, Va.

PROCESS FOR MANUFACTURING SLIT COLLIMATORS

V. P. Romanenko, A. A. Yemelyanov, and K. I. Churbakov *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 89-91 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 3 p (For availability see N74-33976 23-15)

CSCL 13H

Peculiarities are described of the manufacturing process and the control of elements of slit collimators, the structural design of the required equipment and the process or assembling the collimators. Author

N74-33993* Joint Publications Research Service, Arlington, Va.

METHOD OF BOUNDARY TESTING OF THE ELECTRIC CIRCUITS AND ITS APPLICATION FOR CALCULATING ELECTRIC TOLERANCES c09

N. P. Redkina *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 92-99 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 8 p (For availability see N74-33976 23-15)

CSCL 09C

Boundary testing of electric circuits includes preliminary and limiting tests. Preliminary tests permit determination of the critical parameters causing the greatest deviation of the output parameter of the system. The boundary tests offer the possibility of determining the limits of the fitness of the system with simultaneous variation of its critical parameters. Author

N74-33994* Joint Publications Research Service, Arlington, Va.

MONITORING THE PRESENCE OF FOREIGN BODIES IN THE EQUIPMENT

A. V. Breslavets and N. I. Bavykin *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 100-102 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 4 p (For availability see N74-33976 23-15)

CSCL 14D

The methods for monitoring the presence of foreign bodies in radio electronic equipment are discussed. Descriptions of the structural design under the operating principle of the device for detecting foreign bodies weighing to 0.0026 grams are given. Author

N74-33995* Joint Publications Research Service, Arlington, Va.

OPTIMAL REGIME AND CONDITIONING TIME OF TRANSISTORS FOR EQUIPMENT WITH INCREASED RELIABILITY c09

A. V. Breslavets, V. N. Grigoryev, E. I. Kuzyuta, and E. M. Yampolskaya *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 103-110 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 8 p (For availability see N74-33976 23-15)

CSCL 09A

It is shown that an economically justified choice of regime and conditioning time for transistors for equipment of increased reliability is impossible without analyzing the stabilization time of the transistor parameters. The optimal regime and conditioning time are well founded. A method is presented for evaluating the optimal conditioning time by technical economic indexes. Author

N74-33996* Joint Publications Research Service, Arlington, Va.

HOLOGRAPHY AND THE CONTROL OF SELF-PROPELLED VEHICLES c14

V. I. Yeroshin, G. P. Novikov, V. M. Busargin, and T. I. Kurmanaliyev *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 111-142 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 30 p (For availability see N74-33976 23-15)

CSCL 14E

The possibility of applying the principles of holography and

optical data processing in the control of self-propelled space vehicles is considered. Various methods of controlling space vehicles are described: (1) by the results of comparing the image with the standard hologram; (2) by holographic images transmitted over moon earth communications channels; and (3) on the basis of using autotelevision cameras with a three dimensional screen. Procedures are presented for obtaining the standard holograms. The structural organization of the microprogrammed automaton controlling the movement of the space vehicle is also presented. Author

N74-33997*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATOMIC STANDARD WITH VARIABLE STORAGE VOLUME Patent Application
Harry E. Peters, inventor (to NASA) Filed 3 Oct. 1974 14 p
(NASA-Case-GSC-11895-1; US-Patent-Appl-SN-511887) Avail: NTIS HC $4.00 CSCL 13D

A cylindrical, convoluted, flexible bellows is used to form an atomic or molecular storage vessel with constant surface area and surface properties but adjustable volume. When utilized as a storage bulb inside an atomic or molecular frequency standard such as a hydrogen maser, it provides an apparatus for obtaining an extremely accurate measurement of the frequency deviation caused by the interaction of gas atoms (or molecules) with the vessel wall surface (i.e., the socalled wall shift). NASA

N74-33998*# National Aeronautics and Space Administration, Washington, D.C.
MACHINERY, EQUIPMENT AND TOOLS: A COMPILATION Technology Utilization
[1974] 26 p
(NASA-SP-5977(01)) Avail: NTIS HC $1.00 CSCL 13I

A selection of new hand tools, modifications of existing tools, and techniques developed in the course of NASA research and development project is presented. The items are presented in two sections: Power Hand Tools and Accessories, and Manual Hand Tools and Accessories. Author

N74-33999*# National Aeronautics and Space Administration, Washington, D.C.
MATERIALS: A COMPILATION Technology Utilization
[1974] 20 p
(NASA-SP-5974(02)) Avail: NTIS HC $1.00 CSCL 13H

Technical information is provided for the properties and fabrication of metals and alloys, as well as for polymeric materials, such as lubricants, coatings, and insulation. Available patent information is included in the compilation. A.A.D.

N74-34000*# National Aeronautics and Space Administration, Washington, D.C.
FABRICATION TECHNOLOGY: A COMPILATION Technology Utilization
[1974] 26 p
(NASA-SP-5978(01)) Avail: NTIS HC $1.00 CSCL 13H

A compilation is presented which supplies technical information on the assembly of diverse components into functional assemblies and subassemblies, as well as information on several fasteners and fastening techniques that join components, subassemblies, and complete assemblies to achieve a functional unit. Quick-disconnect fasteners are described, along with several devices and methods for attaching thermal insulators, and for joining and separating objects in the absence of gravity. Author

N74-34001*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION BEHAVIOR OF 304 STAINLESS STEEL OF VARYING HARDNESS LUBRICATED WITH BENZENE AND SOME BENZYL STRUCTURES
Donald H. Buckley Washington Sep. 1974 14 p refs
(NASA-TN-D-7787; E-7909) Avail: NTIS HC $3.00 CSCL 11H

The lubricating properties of some benzyl and benzene structures were determined by using 304 stainless steel surfaces strained to various hardness. Friction coefficients and wear track widths were measured with a Bowden-Leben type friction apparatus by using a pin-on-disk specimen configuration. Results obtained indicate that benzyl monosulfide, dibenzyl disulfide, and benzyl alcohol resulted in the lowest friction coefficients for 304 stainless steel, while benzyl ether provided the least surface protection and gave the highest friction. Strainhardening of the 304 stainless steel prior to sliding resulted in reduced friction in dry sliding. With benzyl monosulfide, dibenzyl disulfide, and benzyl alcohol changes in 304 stainlses steel hardness had no effect upon friction behavior. Author

N74-34002*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BONDING OF SAPPHIRE TO SAPPHIRE BY EUTECTIC MIXTURE OF ALUMINUM OXIDE AND ZIRCONIUM OXIDE Patent Application
John J. DeLuca, inventor (to NASA) Filed 17 Sep. 1974 12 p
(NASA-Case-GSC-11577-2; US-Patent-Appl-SN-506803) Avail: NTIS HC $4.00 CSCL 13H

Bonding of an element comprising sapphire, ruby, or blue sapphire to another element of such material with a eutectic mixture of aluminum oxide and zirconium oxide is described. The bonding mixture may be applied in the form of a distilled water slurry or by electron beam vapor deposition. The eutectic is formed in situ by applying a layer of zirconium oxide and then heating the assembly to a temperature above the eutectic temperature and below the melting point of the material from which the elements are formed. The formation of a sapphire rubidium maser cell utilizing eutectic bonding is shown. NASA

N74-34003*# Louisville Univ., Ky. Dept. of Mechanical Engineering.
TRANSIENT ROTORDYNAMIC ANALYSIS FOR THE SPACE-SHUTTLE MAIN ENGINE HIGH-PRESSURE OXYGEN TURBOPUMP
Dara W. Childs 8 Feb. 1974 49 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Spacecraft and Rockets in Feb. 1975 Sponsored by NASA
(NASA-CR-140455) Avail: NTIS HC $5.50 CSCL 13I

A simulation study was conducted to examine the transient rotordynamics of the space shuttle main engine (SSME) high pressure oxygen turbopump (HPOTP) with the objective of identifying, anticipating, and avoiding rotordynamic problem areas. Simulations were performed for steady state operations at emergency power levels and for critical speed transitions. No problems are indicated in steady state operation of the HPOTP emergency power levels, although the results indicated that a rubbing condition will be experienced during critical speed transition at shutdown, particularly involving rotor deceleration rate and imbalance distribution rubbing at the turbine floating-ring seals. The condition is correctable by either reducing the imbalance at the HPOTP hot gas turbine wheels, or by a more rapid deceleration of the rotor through it critical speed. Author

N74-34004# Bendix Corp., Kansas City, Mo.
DEBURRING: AN ANNOTATED BIBLIOGRAPHY
L. K. Gillespie 1973 172 p refs Presented at the SME Intern. Tool and Manufacturing Show Conf., Philadelphia, 29 Apr. 1974
(Contract AT(29-1)-613)
(BDX-613-1124; Conf-740445-4) Avail: NTIS HC $11.75

An annotated bibliography of documents on the subjects of burrs, burr prevention, and deburring of metal surfaces is presented. The bibliography represents an attempt to make burr removal as reliable and predictable a science as metal cutting. The information analyzes burr formation conditions, the mechanics of deburring processes, and a comparison of the capabilities of each process. Additional information is provided on the equipment or tooling used, how to use a process, the economic factors, and measures taken to prevent burrs on metal surfaces. Author

N74-34005# Commissariat a l'Energie Atomique, Saclay (France).
EASE OF MAINTENANCE
C. Guyot 27 Sep. 1973 31 p refs In FRENCH Presented at the Tech. Perfecting on the Advanced Study of Reliability in Electron. Conf., Paris, 22 Oct. 1973
(CEA-Conf-2510; Conf-731072-2) Avail: AEC Depository Libraries HC $4.75

Repair and maintenance of electronic equipment and systems and the resulting reliability of such repairs were evaluated. Special

attention was given to non-repairable equipment and procedures for its removal and replacement. Transl. by E.H.W.

N74-34006# Commissariat a l'Energie Atomique, Saclay (France).
RELIABILITY IN OPERATION: EXAMPLE OF ELECTRONIC MEASUREMENT MATERIALS AT THE CEA
C. Guyot 18 Sep. 1973 21 p refs In FRENCH Presented at the Tech. Perfecting on the Advanced Study of Reliability in Electron. Conf., Paris, 22 Oct. 1973
(CEA-Conf-2509; Conf-731072-1) Avail: AEC Depository Libraries HC $4.25

Problems posed by the upkeep of equipment used in electronics as measurement materials are described. Special attention was given to equipment used to measure current usage, with emphasis on an evaluation of their reliability in operational situations. The operational results obtained are presented and a comparison was made with different results obtained by previous sources. Transl. by E.H.W.

N74-34007# Sandia Labs., Albuquerque, N.Mex.
ION PLATING: REVIEW AND UPDATE
D. M. Mattox 1974 15 p refs Presented at the 6th Intern. Conf. on Electron and Ion Beam Sci. and Technol., San Francisco, 12 May 1974 Sponsored by AEC
(SLA-73-7011; Conf-740515-1) Avail: NTIS HC $4.00

The fundamental concepts of ion plating are reviewed. New applications are presented along with a discussion of several new deposition sources applicable to ion plating. The effect of ion bombardment during deposition on film properties is surveyed and it is shown that ion bombardment may modify film morphology, crystal structure, density, stress, and gas content. NSA

N74-34008# Naval Ordnance Station, Louisville, Ky.
CENTRIFUGAL VACUUM CASTING MACHINE - FEASIBILITY STUDY, PHASE 1 Final Report
Marion D. Boyer Apr. 1974 54 p refs
(AD-781883; NOSL-MT-024) Avail: NTIS CSCL 13/8

The objective is development of a prototype-production process for making aircraft-aerospace quality precision castings. The process would use powdered metals as a charge to be inductively melted directly in lost wax molds (with integral make-up hopper) while under the added gravities of centrifuging force and in a vacuum or inert atmosphere. Literature search indicates that inductive melting of powdered metals (if possible) would require very high frequencies. The versatility of melting various metals would require a broad frequency range, necessitating multiple frequency generating units. Experimentation confirms that the powders are not meltable at moderate frequencies which do not present radiation hazards. The dubious feasibility of melting powdered metals, the radiation hazards of very high frequency generation, and difficulty of transmitting appreciable power at these frequencies, together with equipment economics, dictate that the concept of inductively melting powdered metals be abandoned. Future effort should explore feasibility of melting chunks susceptible to commonly used frequencies in a hopper integral with but separated from the mold by a gate or valve. (Modified author abstract) GRA

N74-34009# Army Construction Engineering Research Lab., Champaign, Ill.
EVALUATION OF LUNAR DRILLING TECHNOLOGY FOR TERRESTRIAL APPLICATIONS: FIELD STUDY Final Report
R. E. Aufmuth Jul. 1974 35 p
(DA Proj. 4A1-62121-A-890)
(AD-781944; CERL-TR-M-92) Avail: NTIS CSCL 13/9

The report presents results of the field evaluation of a NASA-developed drill system which requires no cooling or lubricating agents. Performance of the NASA system was evaluated at sites in Arizona and New Mexico consisting of volcanic and igneous intrusives. Although the NASA system performed well in most of the materials encountered (at a drill rate of approximately 2 inches per minute), presence of unexpected moisture at several sites retarded efficient progress. Conclusions are presented concerning the nature and scope of laboratory tests suggested and justified by the field test results. Author (GRA)

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N74-34010*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPATIAL FILTER FOR Q-SWITCHED LASERS Patent Application
Ralph F. Wuerker and Lee O. Heflinger, inventors (to NASA) Filed 2 Oct. 1974 9 p
(NASA-Case-LEW-12164-1; US-Patent-Appl-SN-511334) Avail: NTIS HC $4.00 CSCL 20E

A spatial filtered Q-switched laser system is disclosed having means to prevent ionization of air in close proximity to the aperture of the spatial filter. A compound lens system having an astigmatic focus is found between the laser and the spatial filter for defocusing the light beam emanating from the laser in the vicinity of the aperture of the spatial filter to an intensity below that which produces ionization of air. The preferred construction of the compound lens system as viewed from the laser comprises a cylindrical lens and a pair of positive lenses. NASA

N74-34011*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VARIABLE CO2 LASER ATTENUATOR
Bernard J. Klein, John J. Degnan, Harold E. Walker, and Thomas Zagwodzki Aug. 1974 37 p refs
(NASA-TM-X-70753; X-723-74-243) Avail: NTIS HC $5.00 CSCL 20E

An infrared wavelength variable attenuator based on contra-rotating germanium wedges is examined theoretically. The device redirects the paths of internal reflections associated with an optical flat to avoid closely spaced parallel beams at the output. Complementary wedges separated by an air gap compose an optical flat which, when combined with a masking arrangement, restricts unwanted reflections. A model of the device was built and experimentally evaluated. The results compare favorably with the dynamic range of attenuation of 2 to 50 db from theoretical calculations, and show a substantial reduction in the etalon effect associated with pairs of optical flats. Author

N74-34012*# National Aeronautics and Space Administration. Pasadena Office, Calif.
DOUBLE DISCHARGE METAL VAPOR LASER WITH METAL HALIDE AS A LASANT Patent Application
Gary R. Russell (JPL), Che-Jen Chen (JPL), and Noble M. Nerheim, inventors (to NASA) (JPL) Filed 3 Oct. 1974 10 p
(Contract NAS7-100)
(NASA-Case-NPO-13448-1; US-Patent-Appl-SN-511888) Avail: NTIS HC $4.00 CSCL 20E

A double discharge metal vapor laser in which a metal halide is used as the lasant, is disclosed. The laser includes a heated discharge tube within which a metal halide is contained. The discharge tube is provided with a pair of electrodes for producing electrical discharges. The ends of the tube are closed with a pair of Brewster windows outside of which are positioned a pair of suitable mirrors. Heating of the discharge tube and the metal halide contained within it produces metal halide vapor. A first electrical discharge causes dissociation of the metal halide vapor to produce metal atoms. After a predetermined time delay to permit metastable relaxation of the metal atoms, a second electrical discharge acts as a pumping pulse to produce a population inversion and hence lasing. NASA

N74-34013*# Kanner (Leo) Associates, Redwood City, Calif.
HETERODYNE METHOD OF MEASURING THE DIFFUSIVE COMPONENT OF LASER MIRRORS
I. I. Dushkov, N. V. Karlov, B. B. Krynetskiy, V. A. Mishin, and R. P. Peterov Washington NASA Oct. 1974 8 p refs Transl. into ENGLISH from Kratk. Soobshch. po Fiz. (USSR), no. 10, 1971 p 10-15
(Contract NASw-2481)
(NASA-TT-F-15969) Avail: NTIS HC $4.00 CSCL 20F

A modified Michelson interferometer, for measurement of the diffusive component of laser mirrors at various angles of

incidence by the heterodyne method, is described and illustrated. Radiation diffusively reflected in the direction opposite to the incident beam was recorded by use of a GeHg photoresistor at liquid nitrogen temperature. Curves of the diffusive reflection power vs. angle of incidence and data on the contribution of the diffusive component are presented. Author

N74-34014*# Kanner (Leo) Associates, Redwood City, Calif.
ANTENNA CHARACTERISTICS OF HETERODYNE RECEIVERS OF CO2 LASER EMITTERS
I.I. Dushkov, N.V. Karlov, B.B. Krynetskiy, V.A. Mishin, and R.P. Petrov Washington NASA Oct. 1974 8 p refs Transl. into ENGLISH from Kratkiye Soobsch. Fiz. FIAN (USSR), no. 1, 1971 p 40-44
(Contract NASw-2481)
(NASA-TT-F-15968) Avail: NTIS HC $4.00 CSCL 20E

An experimental setup for measurement of antenna characteristics of a heterodyne receiver of CO2 laser emitters and its operation are described and illustrated. A 6.6 W LG-17 CO2 laser, with a 0.005 rad divergence, was the radiation source, the Doppler frequency shift device provided a frequency shift of 20 MHz, and Ge-Au and Ge-Zn-Sb photoresistors, with 2 + 2 mm detection area, at a temperature of 78 K, was used. A 20 db gain and a 15-fold narrowing of the directivity pattern to 0.007 rad, were achieved. Comparsion of the experimental curve presented shows that generalized reciprocity theorem can be use to estimate the directivity of a heterodyne detector. It is stated that use of a nonlinear element can eliminate the possibliity of failure to detect a weak signal due to atmospheric turbulence. Author

N74-34015# European Space Research Organization, Paris (France).
THE USE OF LASER LIGHT SCATTERING FOR LOCAL DENSITY MEASUREMENTS IN RAREFIED GASES
Gustave Schweiger Jul. 1974 147 p refs Transl. into ENGLISH of Lokale Dichtemessung in Verduennten Gasen mit Hilfe der Laserlichtstreuung, DLR-FB-73-83, DFVLR, 26 Jun. 1973
(ESRO-TT-83; DLR-FB-73-83) Avail: NTIS HC $10.50; DFVLR, Porz, West Ger. 48.60 DM

The possibilities of local density measurement in rarefied gases by measurement of the intensity of the laser scattered by a gas are investigated theoretically and experimentally. It is shown that by measuring the state of polarization it is theoretically possible to determine the partial densities of gas mixtures under certain conditions. This is also valid for monatomic gases. The statistical behaviour of the scattered light signal is investigated theoretically and experimentally. As a result, criteria are obtained for the evaluation of the accuracy of the gas density measurements, especially for scatter tests in contaminated gases. A test arrangement is described by means of which it was possible to determine the local gas density at pressures of p greater than or equal to 0.1 torr with high spatial resolution. The analysis of the results gave good agreement with theoretical predictions. Author (ESRO)

N74-34016# Institut Franco-Allemand de Recherches, St. Louis (France).
MODE LOCKING OF CO2 LASERS [MODENKOPPELUNG BEI CO2-LASERN]
M. Hugenschmidt and K. Vollrath 31 Aug. 1973 22 p refs In GERMAN
(Contract T/R-720/R-7800/21308)
(ISL-26/73) Avail: NTIS HC $4.25

The spontaneous mode locking of TEA lasers with nonlinear amplification, working according to the Beaulieu principle with excitation by resistance stabilized parallel discharges, was investigated. The parameters considered are essentially gas composition and the pressure in the discharge tube. Mode locking as a method to obtain ultrashort high power inpulses was used for gas, solid and liquid lasers. The pulse half widths obtainable with low pressure CO2 lasers are some 10 ns. For TEA lasers, as a result of pressure increase, one obtains vibration-rotation line widths of a few GHz, so that under consideration of the bandwidth, theoretical pulse half widths of a few 0.1 ns can be expected. In order to couple resonator natural frequencies within this band, active modulators as well as passive saturable absorbers may be used. In many cases spontaneous mode locking may occur, even without these special precautions. ESRO

N74-34017# Institut Franco-Allemand de Recherches, St. Louis (France).
SELF-MODE LOCKING OF A TUNABLE TEA LASER [UNTERSUCHUNG DER SELBSTMODENKOPPELUNG BEI EINEM ABSTIMMBAREN TEA-LASER]
M. Hugenschmidt and K. Vollrath 31 Aug. 1973 21 p refs In GERMAN
(Contract T/R-720/R-7800/21308)
(ISL-27/73) Avail: NTIS HC $4.25

As a result of the nonlinear amplification of CO2 lasers, especially at high pressures, locking of single axial resonant vibrations can take place without external active or passive resonator control. By means of a Littrow lattice a further spectrum range between 10.1 micron to 10.35 micron can be scanned. Spontaneous mode locking then occurs for all vibration-rotation lines. The pressure in the active laser volume has big influence on the form and the reproducibility of the impulses. The impulse half widths resulting from experiments are compared to the theoretical limits for ideal mode locking. The effects of pressure in the discharge tube and of absorber gases are discussed. ESRO

N74-34018# Institut Franco-Allemand de Recherches, St. Louis (France).
APPLICATION OF LASER ANEMOMETRY TO SUPERSONIC FLOW Final Report [VELOCIMETRIE LASER DANS UN ECOULEMENT SUPERSONIQUE RAPPORT DE SYNTHESE FINAL]
C. Bouis, B. Gautier, J. Haertig, and J. P. Hancy 18 Feb. 1974 49 p refs In FRENCH
(Contract DRME-73/096)
(ISL-3/74) Avail: NTIS HC $5.50

The possibility of using laser anemometry to determine the velocity and degree of turbulence in a gas flow, especially supersonic flow, was investigated. The method developed uses interference fringes produced by two laser beams intersecting at a point where the velocity is to be measured. The velocity of dust particles traversing the interference fringe system is measured with impulse counters. The relationship between particle velocity and mean gas flow velocity was investigated in view of relative errors. If too many large particles do not appear in the flow, it is possible to eliminate the signals originated by them. ESRO

N74-34019# Stanford Research Inst., Menlo Park, Calif.
FEASIBILITY OF A CW LIDAR TECHNIQUE FOR MEASUREMENT OF PLUME OPACITY Final Report
Richard A. Ferguson Nov. 1973 96 p refs
(Contract EPA-68-02-0543)
(PB-231992/9; EPA-650/2-73-037) Avail: NTIS HC $8.00 CSCL 17H

The report describes the work performed to develop an eyesafe CW lidar for remote measurement of the opacity of smoke plumes from industrial smoke stacks. The analysis design construction, and evaluation of a laboratory model CW lidar were performed to determine the limitations and potential of the technique. The proof-of-principle experiments combine what is called FM-CW radar technique with an argon laser. The technique involves modulating the intensity of the laser beam at a frequency that changes rapidly and linearly with time. A portion of the transmitted signal is mixed electronically with the light reflected from the targets in a device similar to a radio receiver. Each target appears at a particular frequency. By tuning the radar's receiver to these target frequencies, the researchers were able to measure both the range and the opacity of semitransparent targets over distances of 100 to 200 meters. GRA

N74-34020# Polytechnic Inst. of Brooklyn, N.Y.
BLEACHABLE ABSORBER LASER AMPLIFIER AND DETECTOR: BALAD Final Report, 1 Jan. - 31 Dec. 1972
James T. LaTourrette, Maurice Newstein, S. Y. Szeto, and N. Wright Feb. 1974 87 p refs
(Contract F30602-72-C-0245; ARPA Order 1279)
(AD-780563; PINYEP-74-136; RADC-TR-74-60) Avail: NTIS CSCL 17/5

The report describes the continued development of the

wide-angle, low noise BALAD receiver (Bleachable Absorber Laser Amplifier and Detector). A xenon-xenon 3.5 micrometer BALAD receiver system has been tested. Experimental results are given. The experiments were hampered by excess noise in the xenon absorber discharge. The three dimensional analysis of the propagation of coherent optical pulses with limited transverse extent, predicts a non-linear self-focussing effect. A modified design of the BALAD receiver using a geometrical loss filter based on this effect is presented and analyzed. The design would facilitate the rejection of noise from the other laser amplifier transitions. Author (GRA)

N74-34021# Naval Intelligence Support Center, Washington, D.C. Translation Div.
PULSED COPPER VAPOR LASER WITH 10 kHz PULSE REPETITION FREQUENCY
A. A. Isaev, M. A. Kazaryan, and G. G. Petrash 27 Mar. 1974 7 p refs Transl. into ENGLISH from Opt. i Spektroskopiya (Moscow), v. 35, no. 3, 1973 p 528-530
(AD-781452; NISC-Trans-3528) Avail: NTIS CSCL 20/5

Using a copper vapor laser having a 10 kHz excitation pulse repetition frequency, an average generation power of 2.4 Wt was obtained. This corresponds to a peak power of 48 kWt and a specific peak power of 1.4 kWt/lcc. Author (GRA)

N74-34022# Naval Research Lab., Washington, D.C.
CALCULATIONS FOR A VUV LASER FROM SODIUM VAPOR PUMPED BY RADIATION FROM AN EXPLODING WIRE
Walter W. Jones and Abdul W. Ali Jun. 1974 12 p refs
(AD-781264; NRL-MR-2807) Avail: NTIS CSCL 20/5

Calculations are carried out for a 372 A laser from Sodium using the blackbodylike radiation emitted from an exploding wire. The gain calculations indicate that such a laser is highly probable. Author (GRA)

N74-34023# Wisconsin Univ., Madison. Dept. of Chemistry.
THE CHLOROETHYLENE PHOTOCHEMICAL LASERS: VIBRATIONAL ENERGY CONTENT OF THE HCl MOLECULAR ELIMINATION PRODUCTS
Michael J. Berry Jun. 1974 115 p refs
(Contracts N00014-67-A-0128-0022; F44620-70-C-0029; Grant AF-AFOSR-2423-73; NR Proj. 051-521)
(AD-781732; TR-3) Avail: NTIS CSCL 07/5

Chemical laser techniques have been used to determine relative photochemical product yields and hydrogen chloride photoelimination product vibronic state distributions resulting from chloroethylene photolyses at greater than or equal to 1550 Angstroms. The observed highly nonstatistical product vibronic state distributions are successfully matched by a bootstrap reaction dynamics model which considers sudden structural distortion and intramolecular relaxation of hydrogen chloride as it separates from acetylene and haloacetylene products. Chloroethylene vacuum ultraviolet absorption spectra are also reported. All available spectroscopic, photochemical, and product energy partitioning data are used to formulate a state-to-state photochemical reaction mechanism for hydrogen chloride photoelimination from the chloroethylenes. Author

N74-34024# Arizona Univ., Tucson. Dept. of Physics.
LASER PHYSICS, QUANTUM OPTICS, NON-EQUILIBRIUM STATISTICAL MECHANICS AND ENERGY DETECTORS Final Report
Marlan O. Scully Jun. 1974 46 p refs
(Grant AF-AFOSR-1921-70; AF Proj. 9768)
(AD-782303; AFOSR-74-0967TR) Avail: NTIS CSCL 20/5

The report contains brief summaries of research conducted in various areas, and abstracts of papers produced under the research program. The unifying concept of the work is non-equilibrium statistical mechanics. Research topics include basic laser theory, laser-phase transition analogy, X ray lasers, experimental quantum optics, Josephson radiation and superconductivity, and coherent phenomena. GRA

N74-34025# Williams Coll., Williamstown, Mass. Dept. of Physics.
TUNABLE FAR INFRARED METHYL FLUORIDE LASER USING TRANSVERSE OPTICAL PUMPING Final Report
Fielding Brown, Steven Kronheim, and Eric Silver Dec. 1973 17 p refs Sponsored in part by NSF
(Contract N00014-73-C-0182; NR Proj. 016-413)
(AD-782000) Avail: NTIS CSCL 20/5

Some severe limitations of optically-pumped superradiant FIR lasers (700 MHz line width, ragged pulse shape) may be overcome using transverse optical pumping (TOP). Strong (500 W) lines have been produced in CH3F with linewidth -30 MHz, and cavity tuning has been achieved over a range of 460 MHz at 496 micrometers. Prospects for extending the tuning range and increasing the power are considered. (Modified author abstract) GRA

N74-34026# Army Electronics Command, Fort Monmouth, N.J.
STABILIZATION OF OPTICAL COMMUNICATION SYSTEMS Final Report, 1 Jul. 1972 - 30 Jun. 1973
Thomas C. Hartrum Jul. 1974 22 p refs
(DA Proj. 1S6-62701-A-448)
(AD-781970; ECOM-4229) Avail: NTIS CSCL 17/2

Due to the narrow beam divergence of a laser or optical communication system, small angular motions of either terminal can cause misalignment. This report analyzes such motion which results when the terminal is mounted on a military vehicle subjected to wind forces. A mathematical model is developed for the vehicle and simulated on a digital computer. The resulting motion due to wind forces is analyzed to determine the stabilization requirements for mounting a laser under such conditions. Author (GRA)

N74-34027# California Univ., La Jolla. Dept. of Applied Mechanics and Engineering.
LASER GENERATED ULTRASONIC BEAMS
M. P. Felix May 1974 14 p refs
(Grant AF-AFOSR-1957-70; AF Proj. 9782)
(AD-782017; TR-17; AFOSR-74-1043TR) Avail: NTIS CSCL 14/2

A device has been developed which uses a Q-switched laser pulse to produce a plane compressive stress pulse or a slowly decaying sinusoidal stress wave train in any solid or liquid material. The device uses a thin liquid layer to totally absorb the laser pulse and generate a stress pulse by rapid thermal expansion. Compressive stress pulses of 200 nanosecond duration and up to 5 kilobar amplitude have been obtained. Wave trains of about 30 cycle duration and 1/4 kilobar amplitude (peak-to-peak in typical solids) have been obtained at frequencies between 1-25 MHz. Stress amplitudes may be varied by filtering the incident laser radiation. The laser radiation does not damage this transducer, so it may be used indefinitely. Author (GRA)

N74-34028# Texas Instruments, Inc., Dallas. Central Research Labs.
CHALCOGENIDE GLASSES FOR HIGH ENERGY LASER APPLICATION Final Report, 1 May 1973 - 30 Apr. 1974
A. R. Hilton, D. J. Hayes, and M. D. Rechtin Jun. 1974 85 p refs
(Contract N00014-73-C-0367)
(AD-782036; TI-08-74-44) Avail: NTIS CSCL 20/5

New compounding techniques were devised to prepare high purity TI no. 1173 (Ge28Sb12Se60) and TI no. 20 (Ge33As12Se55). The methods were based on the combination of the reactant purification and compounding steps. The goal of the program was to establish the absorption limit for the glasses and to lower the absorption at 10.6 micrometers. Glasses based on sulfur and selenium were carefully characterized to establish the interdependence between chemical composition and the magnitudes of physical parameters related to their use as infrared optical materials. The sulfur glasses selected for evaluation were from the Ge-Sb-S system. The physical properties of sulfur glasses were substantially better than those of the selenium glasses. Visible transmission was found for glasses containing 60 or more atomic percent sulfur. However, chalcogenide glasses do not appear promising as high energy CO2 laser window materials. (Modified author abstract) GRA

N74-34029# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
HIGH-EFFICIENCY, SINGLE-FREQUENCY LASER AND MODULATOR STUDY Quarterly Technical Report
R. C. Ohlmann, K. K. Chow, J. J. Younger, W. B. Leonard, and

J. Kannelaud 30 Jun. 1973 16 p
(Contract N00014-71-C-0049; ARPA Order 306)
(AD-782222; QTR-9) Avail: NTIS CSCL 20/5

The work described in this report is the final year's effort of a three-year program to study wide bandwidth laser communications at 1.06-micrometer wavelengths. The detailed objectives of this study program are as follows: (1) Design a laboratory communication system, using 1.06-micrometer radiation from a Nd:YAG laser and having a system bandwidth of 2 to 4 GHz; (2) Assess the state-of-the-art of high-frequency photodetectors, with emphasis on a cross-field photomultiplier tube (PMT), that offer good frequency and spectral response and are suitable as the receiver elements of this communication demonstration; (3) Define and design the necessary microwave, digital-modulation and frequency-modulation subsystems for the communication system; (4) Assembly and operate the various subsystem; and (5) Demonstrate and evaluate the system performance in a laboratory environment. During this quarter, objectives (1), (2) and (3) have basically been accomplished. GRA

N74-34030# Edgerton, Germeshausen and Grier, Inc., Salem, Mass.
OPTICAL PUMPS FOR LASERS Final Report, 24 Apr. 1972 - 23 Jun. 1973
P. Bruce Newell Mar. 1974 77 p refs
(Contract DAAB07-72-C-0165; DA Proj. 1S7-62703-A-186)
(AD-782233; ECOM-0165-F-72) Avail: NTIS CSCL 20/5

The specific objective was to investigate and improve those lamp design and operating parameters which affect laser beam quality in a given laser cavity. The parameters which were investigated included: gas fill and gas pressure, arc diameter, preionization techniques, laser rod size, and laser rod surface condition. The lamps were evaluated in free air, in a fluorescence measuring device, and in actual laser cavities. (Modified author abstract) GRA

N74-34031# Chrysler Corp., Center Line, Mich.
CHRYSLER DEFENSE ENGINEERING LASER LOCKON TRACKING DEVICE Final Report
Lloyd A. Whetter Mar. 1964 92 p refs
(Contract DA-20-018-AMC-1095T)
(AD-782359) Avail: NTIS CSCL 17/8

A laser lockon tracking device has been investigated from two implementation points of view. One approach considers a tracking system employing a single laser transmitting beam and two detection devices. A second secondary system employs two laser transmitting beams and two detectors. The main problems in the projected design is to obtain sufficiently fast and stable pulse rates to track tank targets at nominal speeds and the projected ability of each system to track in the presence of obstructions which produce clutter noise in the receiver. The findings show that both systems have the capability of tracking under limited conditions. It is concluded that the system type selected would necessarily require the test of a prototype model to determine the extent of the applicability in the field. It is recommended however that the monopulse system be considered for an anticipated Phase 2 Program. Author (GRA)

N74-34032# California Univ., Berkeley. Coll. of Engineering.
RESEARCH ON LEAD-TIN-TELLURIDE INFRARED EMITTERS AND DETECTORS Final Report, 1 Jun. 1972 - 15 Mar. 1974
W. G. Oldham Mar. 1974 21 p
(Grant AF-AFOSR-2385-72; AF Proj. 9768)
(AD-782061; AFOSR-74-1139TR) Avail: NTIS CSCL 20/5

A program to develop practical widely tunable infrared lasers was begun. A Pb/p-type PbTe Schottky barrier technology for junction fabrication was developed. The process requirements for reproducible junctions were established. (Modified author abstract) GRA

N74-34033# Aerospace Corp., El Segundo, Calif.
ATMOSPHERIC GAS ABSORPTION AT DF LASER WAVELENGTHS Interim Report
Donald J. Spencer, Genevieve C. Danault, and Hideyo H. Takimoto 15 Jan. 1974 62 p refs
(Contract F04701-73-C-0074)
(AD-781982; TR-0074(4240-10)-7; SAMSO-TR-74-7) Avail: NTIS CSCL 07/4

The absorption of 24 DF laser wavelengths ranging from 3.6128 micrometers to 4.0464 micrometers was measured for CH4, N2O, CO2, and HDO vapor. Total absorption was calculated for the lines for each of these absorbing gases and for the N2 and H2O continua independently and collectively for two representative transmission paths (midlatitude summer model). A comparison of the measured absorption coefficients was made with calculated values of McClatchey and Selby for 17 lines. (Modified author abstract) GRA

N74-34034# Northrop Corp., Hawthorne, Calif.
UV GAS LASER INVESTIGATIONS Semiannual Technical Report
M. L. Bhaumik, E. R. Ault, and N. Thomas Olson May 1974 31 p refs
(Contract N00014072-C-0456)
(AD-782219; NRTC-74-26R) Avail: NTIS CSCL 20/5

A peak laser power of 0.5 MW with an estimated efficiency of 0.2% has been obtained at 3577A from a mixture of 92 psia Ar and 8 psia N2 which was excited by an E-beam of 400A/cm squared at 1.3 MeV in a 20 ns pulse. A saturation intensity of about 100 kW/cm squared was deduced and a beam divergence of 10 milliradian was measured from the laser having a 10 cm gain length. Author (GRA)

N74-34035# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
HIGH-EFFICIENCY, SINGLE-FREQUENCY LASER AND MODULATOR STUDY Quarterly Technical Report
R. C. Ohlmann, K. K. Chow, J. J. Younger, W. B. Leonard, and D. G. Peterson 31 Dec. 1973 27 p refs
(Contract N00014-71-C-0049)
(AD-782440; QTR-11) Avail: NTIS CSCL 20/5

The work described in this report is the final year's effort of a three-year program to study wide bandwidth laser communications at 1.06 micrometer wavelength. In addition, a study was also made of laser communication configurations that were suitable for very high data rates. The results of this quarter's work indicate that the combined 1-GHz FM analog and 1-Gbit/sec digital data transmission is feasible over a 1.06 micrometer laser link in the laboratory. GRA

N74-34036# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
HIGH-EFFICIENCY, SINGLE-FREQUENCY LASER AND MODULATOR STUDY Annual Technical Report
R. C. Ohlmann, K. K. Chow, J. J. Younger, W. B. Leonard, and D. G. Peterson 15 Jun. 1974 58 p refs
(Contract N00014-71-C-0049; ARPA Order 306)
(AD-782189; LMSC-D403175; ATR-3) Avail: NTIS CSCL 20/5

The work described in this report is the final year's effort of a three-year program to study wide bandwidth laser communications at 1.06-micrometer wavelength. Earlier efforts of this program (during the first two years) were directed to studying the means to produce a high-efficiency, single-frequency neodynium doped yttrium aluminum garnet (Nd:YAG) laser operating at 1.06 micrometer, and to produce high-efficiency, octave-bandwidth, microwave light modulators for this wavelength. In addition, a study was also made of laser communication configurations that were suitable for very high data rates. The overall objective of this year's program, then, is to apply the results of these earlier studies to assemble a laboratory communication system that uses the entire modulation bandwidth available. In particular, the final result of this program is to be a laboratory demonstration of a laser-communication system having a bandwidth of 2 GHz. GRA

N74-34037# United Aircraft Corp., East Hartford, Conn. Research Labs.
INVESTIGATION OF THE FEASIBILITY OF A MAGNETOHYDRODYNAMIC LASER Final Report, 3 Jun. 1971 - 30 Apr. 1974
Robert H. Bullis, Thomas L. Churchill, William L. Nighan, Peter O. Erlandsen, and Elliot R. Schulman 31 May 1974 92 p refs
(Contract N60921-71-C-0279)

(AD-781997; UARL-N921308-4) Avail: NTIS CSCL 20/5

The investigation is directed towards the evaluation of the feasibility of a magnetohydrodynamic laser concept (MHDL) employing nonequilibrium electron kinetics to provide efficient energy transfer in a molecular laser system. To achieve this goal comprehensive modeling of the MHD plasma which has been based upon a detailed knowledge of electron and heavy particle kinetics has been developed. Experimental investigations conducted on small scale laminated and solid wall generator configurations have confirmed theoretical modeling predictions and indicate the potential attractiveness of the MHDL concept for high power laser applications. Major emphasis in the report has been placed on the additional experimental information obtained from small scale generator tests as well as experimental results obtained in a generator configuration suitable for optical power extraction investigations. Author (GRA)

N74-34038# Chalmers Univ. of Technology, Goteborg (Sweden). Research Lab. of Electronics.

ON MASER AMPLIFICATION OF INCOHERENT RADIATION, PART 2

Bengt Isaksson Nov. 1973 109 p refs

(PB-232599/1; RR-118-Pt-2) Avail: NTIS HC $8.50 CSCL 20E

The report considers travelling wave amplification of incoherent radiation by a maser, (or laser). The influence of the nonlinear atomic response of the amplifier on the various characteristics of the field is investigated such as the total field intensity, the spectral density, the field correlation time (line width), and most generally the statistical properties of the electromagnetic field. The application to interstellar masers is discussed. GRA

N74-34039# Massachusetts Inst. of Tech., Cambridge. Crystal Physics Lab.

BLUE-GREEN LASER MATERIAL Research Report, 1 Dec. 1971 - 30 Nov. 1973

Arthur Linz, Hans P. Jenssen, David R. Gabbe, Dan Castleberry, and Mark H. Douma 30 May 1974 146 p refs

(AD-782649; TR-17) Avail: NTIS CSCL 20/5

Laser action has been demonstrated in Xe flash lamp pumped crystals of Li(Y(1-x)Tbx)F4, (Tb YLF), at 545 nm. Research on top-seeded solution growth of scatter-free crystals is described, together with zone refining and other techniques for feed purification. A closed loop computer-controlled growth system is described which is suitable for commercial production of YLF and which does not require corrosive and poisonous cover gases such as HF. Author (GRA)

N74-34040# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

KINETICS OF HIGH PRESSURE CHEMICAL LASERS

V. A. Kochelap and Yu. A. Kukibnyi 14 Jun. 1974 21 p refs Transl. into ENGLISH from Ukr. Fiz. Zh., (USSR), v. 18, no. 3, 1973 p 378-388

(AD-782544; FTD-HT-23-860-74) Avail: NTIS CSCL 20/5

The study of the kinetics of high-pressure chemical lasers is continued. The time evolution of the system in the neighborhood of the stationary state was studied. It is shown that depending on the relation of the parameters of the system and the pumping level, the approach to the stationary state has the nature of damped oscillations or of aperiodic motion. Detailed investigation of stationary states shows that conditions exist when with one and the same pumping power there are two different stationary states. The investigation of time equations points to the instability of states with lesser photon density. GRA

N74-33981* Joint Publications Research Service, Arlington, Va.

DEVELOPMENT AND PLANNING AND DESIGN OF EQUIPMENT PUMPING GENERATOR OF SEMICONDUCTOR LASERS

A. V. Popkov *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 25-30 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 6 p (For availability see N74-33976 23-15)

CSCL 17I

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N74-34041 British Library Lending Div., Boston Spa (England).

OSCILLATION OF SPIN DENSITY IN DILUTE IRON BASED SOLID SOLUTIONS

Yu. S. Stark, A. Sh. Chavchanidze, and G. N. Zakharov [1974] 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 9, 1973 p 122-123

(BLL-M-21843-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

A calculation has been made of the wave vector on the Fermi surface for substitutional solid solutions based on iron from experimental nuclear magnetic resonance data. For impurities of elements left and right of iron in the Mendeleev periodic table, the wave vectors differ in absolute magnitude. Author

N74-34042 British Library Lending Div., Boston Spa (England).

KINEMATIC VISCOSITY OF LIQUID CAST IRON

L. I. Levi, G. I. Kletskin, and A. M. Nikitich [1974] 12 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 9, 1973 p 166-168

(BLL-M-21844-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

The kinematic viscosity of cast iron was related to composition, melting conditions and microstructure. An increase in iron temperature and time of heat exposure lead to a marked decrease in viscosity. It is shown that with a change in melting conditions there is a marked reduction in the content of gases and stable oxide inclusions in the pig iron. The viscosity also depends on the original structure of the iron, which affects the number and dimensions of undissolved blocks of graphite in the melt. Author

N74-34043 British Library Lending Div., Boston Spa (England).

ELIMINATING THE INCREASED BRITTLENESS OF SIZED GRADE 23G2A STEEL

P. I. Soshin, M. P. Nalivaiko, L. N. Levkovich, and T. I. Larina [1974] 7 p refs Transl. into ENGLISH from Stal (USSR), v. 9, 1973 p 837-838

(BLL-M-21851-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Sized 16 mm to 19 mm diameter bars of grade 23G2A steel, intended for the production of high strength chains whereby the links are cold bent in automatic bending machines, have increased hardness, which causes large amounts of metal to be rejected for fracture of the links. The structure, at the fractures, consists of equiaxed ferrite, sorbite-form pearlite, and acicular ferrite. Annealing for 5 h at 750 C and cooling in the air eliminates the defect. This treatment provides a hardness of 174 HB to 179 HB, and cooling can be carried out with the furnace.

Author

N74-34044# Aeronautical Research Labs., Melbourne (Australia).

OPERATOR EFFECTS IN NDI-PART 3 ULTRASONIC MEASUREMENTS ON ALUMINIUM ALLOY BLOCKS CONTAINING EDGE SLOTS

H. R. Chin Quan Mar. 1974 18 p refs

(ARL/MET-101) Avail: NTIS HC $4.00

Nondestructive tests of aluminum alloy blocks with edge slots using ultrasonic techniques are discussed. Emphasis is placed on the error introduced by the test operators. The test equipment and the experimental procedure are described. The effectiveness of the operation is analyzed with respect to: (1) overall operator performance, (2) instrument effects, and (3) the signal display. Tables of data are provided to show slot detectability at various sensitivity levels. Graphs are developed to show the effects of suppression on accuracy. Author

N74-34045# Royal Aircraft Establishment, Farnborough (England).

PHASE TRANSFORMATIONS IN TITANIUM ALLOY

TiAl6V4
M. Majdic and G. Ziegler May 1974 50 p refs Transl. into ENGLISH from Deut. Luft- und Raumfahrt Report DLR-FB-73-38 (West Germany), 1973
(RAE-Lib-Trans-1746; BR42118; DLR-FB-73-38) Avail: NTIS HC $5.50

The microstructure of rod and plate products of the titanium alloy TiAl6V4 is, in some instances, inhomogeneous; these changes in microstructure effect differences in mechanical properties, particularly in fracture toughness. The composition, volume fraction, size, form and distribution of the phases are determined by definite temperature ranges and homogeneous deformation. The effect of microstructure on the compensation of fluctuations in concentration, on exceeding the beta transus and on the formation of martensite have been studied with two batches in which the amount, grain size and morphology of the beta phase differed. The kinetics of the phase transformations are summarized in isothermal and continuous TTT-plots. The combination of the results of early studies with the present detailed analysis of the effect of the metastable beta phase on transformation products and processes, gives the present state of knowledge of transformation behaviour in the titanium alloy TiAl6V4.
Author

N74-34046*# Westinghouse Astronuclear Lab., Pittsburgh, Pa.
INTERDIFFUSION BEHAVIOR OF TUNGSTEN OR RHENIUM AND GROUP 5 AND 6 ELEMENTS AND ALLOYS OF THE PERIODIC TABLE, PART 1 Final Report
F. G. Arcella Sep. 1974 245 p refs
(Contract NAS3-13231)
(NASA-CR-134490; WANL-M-FR-74-005-Pt-1) Avail: NTIS HC $15.25 CSCL 11F

Arc cast W, CVD W, CVD Re, and powder metallurgy Re materials were hot isostatically pressure welded to ten different refractory metals and alloys (Cb, Cb-1Zr, Ta, Ta-10W, T-111, ASTAR-811C, W-25Re, Mo-50Re, W-30Re-20Mo, ect.) and thermally aged at 10 to the minus 8th power torr at 1200, 1500, 1630, 1800, and 2000 C for 100 to 2000 hours. Electron beam microprobe analysis was used to characterize the interdiffusion zone width of each couple system as a function of age time and temperature. Extrapolations of interdiffusion zone thickness to 10,000 hours were made. Classic interdiffusion analysis was performed for several of the systems by Boltzmann-Matano analysis. A method of inhibiting Kirkendall voids from forming during thermal ageing of dissimilar metal junctions was devised and experimentally demonstrated. An electron beam weld study of Cb-1Zr to Re and W-25Re demonstrated the limited acceptability of these welds.
Author

N74-34047*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AUGER ELECTRON SPECTROSCOPY AND DEPTH PROFILE STUDY OF OXIDATION OF MODIFIED 440C STEEL
John Ferrante Washington Oct. 1974 24 p refs
(NASA-TN-D-7789; E-8004) Avail: NTIS HC $3.00 CSCL 11F

Auger electron spectroscopy (AES) and sputtering were used to study selective oxidation of modified 440C steel. The sample was polycrystalline. Oxidation was performed on initially clean surfaces for pressures ranging from 1 x 10 to the minus 7th power to 1 x 10 to the minus 5th power torr and temperatures ranging from room temperature to 800 C. AES traces were taken during oxidation. In situ sputtering depth profiles are also obtained. A transition temperature is observed in the range 600 to 700 C for which the composition of the outer surface oxide changed from iron oxide to chromium oxide. Heating in vacuum about 5 x 10 to the minus 10 power torr to 700 C causes conversion of the iron oxide surface to chromium oxide.
Author

N74-34048*# Battelle Columbus Labs., Ohio.
ENVIRONMENTAL PROTECTION OF TITANIUM ALLOYS AT HIGH TEMPERATURES
I. G. Wright, R. A. Wood, and M. S. Seltzer 18 Jul. 1974 71 p refs
(Contract NAS3-17761)
(NASA-CR-134681) Avail: NTIS HC $6.75 CSCL 11F

Various concepts were evaluated for protecting titanium alloys from oxygen contamination at 922 K (1200 F) and from hot-salt stress-corrosion at 755 K (900 F). It is indicated that oxygen-contamination resistance can be provided by a number of systems, but for hot-salt stress-corrosion resistance, factors such as coating integrity become very important. Titanium aluminides resist oxygen ingress at 922 K through the formation of alumina (on TiAl3) or modified TiO2 (on Ti3Al, TiAl) scales. TiAl has some resistance to attack by hot salt, but has limited ductility. Ductile Ti-Ni and Ti-Nb-Cr-Al alloys provide limited resistance to oxygen ingress, but are not greatly susceptible to hot-salt stress-corrosion cracking.
Author

N74-34049# Commissariat a l'Energie Atomique, Saclay (France).
EFFECT OF THE ANNEALING TEMPERATURE ON THE CREEP STRENGTH OF COLD WORKED ZIRCALOY-4 CLADDING
J. M. Frenkel and M. Weisz 1973 6 p Presented at the Symp. on Zirconium in Nucl. Appl., Portland, Oregon, 21-24 Aug. 1973
(CEA-Conf-2530; Conf-730822-3) Avail: AEC Depository Libraries HC $3.00

Transverse creep strength of Zircaloy-4 tubing annealed at 440 to 650 C was evaluated by internal pressure tests, short-time control tests at 400 C, and long-time tests (both out-pile or in-pile) between 330 to 400 C. For low and intermediate stresses (lower than 133 MPa), transverse creep strength increases if the annealing temperature is increased from 440 to 650 C. In-pile tests confirm this trend. The effect of the annealing temperature on the yield and creep anisotropy of the tubes was evaluated at 400 C. It is concluded that the beneficial effect of a recrystallization treatment on the creep strength of zircaloy 4 tubes is related to an effect of texture variation. Author (NSA)

N74-34050# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Material und Festkoerperforschung.
CREEP-RUPTURE BEHAVIOR OF INCONEL 625 IN THREE DIFFERENT PRETREATMENTS
M. Schirra Feb. 1974 50 p refs In GERMAN
(KFK-1925) Avail: AEC Depository Libraries HC $5.50

The creep and time-to-rupture behavior of Inconel 625 was investigated in the temperature range 650 to 800 C. Three different thermomechanical pretreatments were employed: (1) hot rolled finish; (2) 870 C anneal; and (3) solution treatment. The temperature range of this study is for samples which have undergone treatment and well above the temperatures normally employed. Results show an anomalous stress dependence of creep and time-to-rupture at around 750 C. The reason is to be found in the very complex precipitation processes occurring while the stress is applied. Results are explained according to newer findings about precipitation in this type of alloy. Author (NSA)

N74-34051# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorwerkstoffe.
CONTRIBUTION TO INVESTIGATION OF PERTURBING INFLUENCES IN THE QUANTITATIVE SPECTRAL ANALYSIS OF Al ALLOYS
J. Stachova Dec. 1973 93 p refs In GERMAN; ENGLISH summary
(JUL-1028-RW) Avail: AEC Depository Libraries HC $7.75

Studies were made of the influence of different perturbing parameters in quantitative spectrochemical analysis subjected to spark discharge at high voltage of aluminium alloys. In particular the effect of type and concentration of alloying elements, the effect of the discharge gas and the effect of the mechanical condition of electrode surface on the measured results are examined. It is found that the composition of a multi-component system similar to the physical properties of the discharge gas affects the evaporation behavior of the single alloy components. Beyond that different discharge gases cause a change of the excitation processes. In addition it is possible to prove that the measured results of the quantitative spectral analysis depend on the metallurgical properties of the alloy. The different results of this study are discussed, tested on their mutual dependence, and explained in models.
Author (NSA)

N74-34052# Centro Informazioni Studi Esperienze, Milan (Italy).
INITIAL ACTIVITY IN THE STUDY OF ORIENTED EUTECTIC SUPERALLOYS FOR USE AT HIGH TEMPERATURE

A. Bassi, C. A. Be, G. A. Camona, and D. Wenger Dec. 1973 30 p refs In ITALIAN
(CISE-N-165) Avail: AEC Depository Libraries HC $4.50

Initial results are given of the study of the oriented eutectic superalloy Ni-Ni3Ta, intended as a base material for gas-turbine blades with a characteristic operating temperature above 1000 C. Morphological and structural analyses were made of the alloy. NSA

N74-34053# Commissariat a l'Energie Atomique, Grenoble (France).
CELLULAR MODEL OF ALLOYS AND ORDER OF THE MAGNETIC TRANSITIONS IN INVAR
L. Billard and M. Natta 1973 10 p refs Presented at the Intern. Conf. on Disordered Alloys, Strasbourg, France
(CEA-Conf-2587; Conf-730977-2) Avail: AEC Depository Libraries HC $4.00

The order of the magnetic transitions in INVAR was discussed in the frame-work of the Smoluchowski method. This theory was interpreted as a Landau theory in order to explain the Mossbauer spectra. The comparison of the results with experiments confirms the R. J. Weiss hypothesis of a first order transition around 30% of nickel; however, specific heat data indicate the possibility of occurence at the Fermi level of a high density of states for the majority spin band. Author

N74-34054# Commissariat a l'Energie Atomique, Saclay (France).
HIGH TEMPERATURE CREEP OF SINGLE CRYSTALS OF GOLD, SILVER, AND SOLID SOLUTION GOLD SILVER 50-50 Ph.D. Thesis
P. Dorizzi Mar. 1974 53 p refs In FRENCH
(CEA-R-4536) Avail: AEC Depository Libraries HC $5.75

The physical mechanisms and structure of high temperature creep in gold, silver, and solid solution gold-silver 50-50 single crystals were studied. Consideration was also given to constant strain and the diffusion of point defects. Transl. by E.H.W.

N74-34055# Commissariat a l'Energie Atomique, Grenoble (France).
SIGNAL PROCESSING AND CYBERNETICS
J. Max 8 Jan. 1973 28 p refs In FRENCH Presented at the 7th Intern. Congr. on Cybernetics, Namur, Belgium
(CEA-Conf-2549; Conf-7309102-1) Avail: AEC Depository Libraries HC $4.50

Procedures and techniques for treating and processing noise signals in cybernetics are introduced. Special attention was given to Fourier transformations and correlation techniques.
Transl. by E.H.W.

N74-34056# British Steel Corp., Sheffield (England). Information Services.
THE FATIGUE BEHAVIOR OF WELDED REINFORCING STEELS
T. C. Harrison Apr. 1974 25 p
(PB-232237/8; GS/PROD/207/1/73/C) Avail: NTIS HC $4.25 CSCL 11F

Fatigue tests have been carried out on welded samples of hot rolled plain mild steel and hot rolled ribbed high yield steel (Unisteel 410) reinforcing bars having diameters up to 32mm. Stress range-endurance curves for lives up to 10 to the 7th power cycles have been established for four types of welded joint; flash butt and electric arc welded butt welds and electric resistance and electric arc cross tack welds. The results are discussed in terms of a code of practice which has been proposed as the basis for a revised form of the fatigue design rules to be incorporated in BSS153, which is being redrafted as a limit state standard covering the design and construction of both steel and concrete bridges. Author (GRA)

N74-34057# Ballistic Research Labs., Aberdeen Proving Ground, Md.
DEPOSITION PROFILES BY VAPORIZATION EXPANSION WAVE METHOD Technical Report, Jun. 1972 - Jun. 1973
Henry S. Burden Apr. 1974 30 p refs
(DA Proj. 1W0-62105-A-660)
(AD-781494; BRL-MR-2370) Avail: NTIS CSCL 11/6

A scheme is presented for measurement of deposition profiles in electrically conducting materials, effective in an energy range in which the material is in the mixed liquid-vapor state. An oscillographic record of sensor resistance may be made to yield a plot of deposited energy as a function of depth in the sensor by use of a slow, vaporization-expansion wave model. The results of tests in copper and aluminum sensors are shown and steps to improve accuracy are discussed. Author (GRA)

N74-34058# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DETERMINING THE VAPOR PRESSURE OF METALS AT HIGH TEMPERATURES
V. M. Amonenko, V. E. Ivanov, G. P. Kovtun, V. S. Pavlov, and A. A. Kruglykh 17 Jun. 1974 14 p refs Transl. into ENGLISH from the book "Eksperimentalnaya Tekhnika i Metody Vysokotemperaturnykh Izmerenii" USSR, 1966 p 85-90
(AD-781623; FTD-HT-23-887-74) Avail: NTIS CSCL 11/6

In this work the vapor pressure of refractory metals was determined using the evaporation rate of a substance from a cylindrical crucible. The use of such a crucible for determining the evaporation rate has a number of advantages. The duration of the test in determining the evaporation of the substance from such a crucible is considerably shorter than during the evaporation from an effusion cell. GRA

N74-34059# Brown Univ., Providence, R.I. Dept. of Engineering.
THERMALLY ACTIVATED FLOW AND STRAIN RATE HISTORY EFFECTS FOR SOME POLYCRYSTALLINE FCC METALS Technical Report, Mar. 1974
J. Klepaczko Mar. 1974 46 p refs
(Grant DA-ARO(D)-31-124-73-G182)
(AD-781222; ARO-D-G182/7) Avail: NTIS CSCL 11/6

It is shown in the paper that the strain rate history effects play a very important role in the plastic behavior of polycrystalline fcc metals. These effects are attributed to some differences in the effective dislocation multiplication rates at different strain rates. A mathematical description of the effects discussed is possible by a coupling of two relationships. One of these is the relation resulting from the thermally activated process which is dominating at a certain level of strain, while the second is of an evolutionary type. An evolutionary relationship describes the changes in structure during the course of plastic deformation. A few examples of an evolutionary relationship along with a thermally activated intersection model are discussed. (Modified author abstract) GRA

N74-34060# Naval Underwater Systems Center, New London, Conn.
ERROR PROBABILITY CHARACTERISTICS FOR ORTHOGONAL MULTIPLE ALTERNATIVE COMMUNICATION WITH D-FOLD DIVERSITY
Albert H. Nuttall 19 Jun. 1974 48 p refs
(NUSC Proj. A-752-05; NUSC Proj. 614-19)
(AD-781845; NUSC-TR-4769) Avail: NTIS CSCL 09/4

The error probability characteristics for orthogonal multiple alternative (M-ary) communication with D-fold diversity are plotted for M = 2, 3, 4, 8, 16, 32, 64 and for D = 1, 2, 3, 4, 5, 6, 8, 12, 16, 24, 32, 48, 64 in a range of M-ary character error probabilities Pe from 0.1 to 0.00001. The curves are plotted in two ways - versus the total signal-energy-to-noise-density ratio and versus the signal-energy-to-noise-density ratio per diversity branch. These curves permit quick determination of the optimum number of diversity branches D to employ for specified values of M and Pe and the required average total received signal-energy-to-noise-density ratio. The curves also afford quantitative measures of the losses incurred by not employing the optimum number of diversity branches, such as might be imposed by a limited bandwidth. Bandwidth requirements are discussed for frequency diversity, and a signal design example using the above curves for a simple tradeoff study is presented. Author (GRA)

N74-34061# Stanford Univ., Calif. Dept. of Applied Mechanics.
ANALYSIS OF DYNAMIC DEFORMATION OF A POROUS MEDIUM Interim Technical Report, Mar. 1973 - May 1974
E. H. Lee, R. L. Mallett, T. C. T. Ting, and W. H. Yang May 1974 19 p refs
(Contract DOT-OS-30091)

(PB-232882/1; SUDAM-74-3; DOT-TST-74-18) Avail: NTIS HC $3.00 CSCL 11F

The average or macroscopic stress-strain characteristics of a porous medium are deduced from an analysis of the microscopic deformation adjacent to the pores. The porous medium is considered to be manufactured from a ductile metal matrix. An appropriate deformation problem for a single cell surrounding a cavity is generated and solved for elastic-plastic material response, and this determines the overall response of the medium. Even when the matrix metal itself is not rate sensitive, the inertia associated with the microscopic motion during cavity deformation and collapse under compressive loads can introduce a strain-rate influence on the average or macroscopic stress. This effect is evaluated, and shown to be negligible for loading rates comparable to those occurring in automobile collisions, so that a much simpler quasistatic analysis is satisfactory for such applications. Comparison with related work is discussed. GRA

N74-34062# Army Foreign Science and Technology Center, Charlottesville, Va.

INVESTIGATION OF THE EFFECT OF CERTAIN ELEMENTS ON THE HEAT RESISTANCE OF TITANIUM ALUMINIDE Ti3 Al

O. N. Andreev and I. I. Kornilov 19 Mar. 1974 7 p refs Transl. into ENGLISH from the monograph "Novyi Konstruktsionny Material-Titan" Moscow, 1972 p 101-104

(AD-781936; FSTC-HT-23-231-74) Avail: NTIS CSCL 11/6

The effect of one at. % of group IV - VIII transition metals and group IVB elements on the heat resistance of Ti3Al was investigated. From group IV Zr and Hf were selected; from group V, V, Nb, and Ta; from group VI, Cr, Mo, and W; from group VII, Mn; from group VIII, Fe, Co, and Ni; and C, Si, Ge, Sn, and Pb were selected from group IVB. GRA

N74-34063# Stanford Univ., Calif. Dept. of Applied Mechanics.

DYNAMIC ANALYSIS OF THE DEFORMATION OF STRUCTURES AND OF METAL FORMING Technical Report, Mar. 1973 - Apr. 1974

E. H. Lee, R. L. Mallett, T. C. T. Ting, and W. H. Yang Apr. 1974 30 p refs

(Contract DOT-OS-30091)

(PB-232552/0; SUDAM-74-2; DOT-TST-74-17) Avail: NTIS HC $3.25 CSCL 11F

In the dynamic analysis of the deformation of bodies and structures it is often found that the duration of significant loads and high stresses is such that stress waves reflect from the surfaces and traverse the body many times in the period of interest for stress and deformation analysis. This circumstance can apply for many impact problems such as the study of automobile collisions and hammer forging. For many problems, particularly when plastic flow occurs, numerical methods of solution must be utilized. The equations to be solved for dynamic deformation of a continuous medium are of wave type, but if dynamic elastic-plastic computer codes, such as those available and developed for ballistics problems which analyze the wave propagation, are used for problems of the type considered in this report, excessive computing effort and round-off errors can be expected. (Modified author abstract) GRA

N74-34064# Stanford Univ., Calif. Dept. of Materials Science and Engineering.

STUDIES ON THE WARM WORKING CHARACTERISTICS OF ALLOYS Final Report, 8 Dec. 1972 - 31 Mar. 1974

Conrad M. Young, Bruno Walser, and Oleg D. Sherby May 1974 72 p refs

(Contract DAAG46-73-C-0163; DA Proj. 1T1-61101-A-91A)

(AD-782248; AMMRC-CTR-74-42) Avail: NTIS CSCL 11/6

The dislocation substructures developed in AISI 304 stainless steel, Mangalloy (Fe-14% Mn - 3% Ni) and E-Brite 26-1 (Fe-26% Cr - 1% Mo) have been studied as a function of various warm working conditions. Warm working studies were performed in the range 0.4 to 0.6 T sub m (T sub m is the melting temperature of the alloy) and at strain rates from 0.01/s to 6.3/s. The dislocation substructure (which usually consisted of subgrains) was captured by rapid quenching after torsional deformation and examined using thin film transmission electron microscopy. The room temperature compression yield strength of the alloys investigated was determined after warm working and quenching. (Modified author abstract) GRA

N74-34065# Army Foreign Science and Technology Center, Charlottesville, Va.

DAMPING PROPERTIES OF LIGHT ALLOYS

L. L. Rokhlin, M. E. Drits, V. V. Sheredin, and G. V. Ryuchina 20 Apr. 1974 11 p refs Transl. into ENGLISH from the book "Splavy Tsvetnykh Metallov" Moscow, 1972 p 215-219

(AD-782001; FSTC-HT-23-1429-73) Avail: NTIS CSCL 11/6

Damping characteristics for magnesium and aluminum alloys were determined on cast and deformed materials. All loading was torsional. Measurements were taken for vibrational decrement, strain, and amplitude. The data show a magnesium alloy, (Mg-0.6Zr) to be most suitable for structural applications requiring resistance to vibrational loading. GRA

N74-34066# California Univ., Los Angeles. School of Engineering and Applied Science.

THE EFFECT OF MICROSTRUCTURE ON THE FRACTURE TOUGHNESS OF LOW-ALLOY STEELS

S. Ensha and A. S. Tetelman May 1974 198 p refs

(Contract DAHC04-69-C-0008)

(AD-782217; UCLA-ENG-7435; AROD-8016-13-MC) Avail: NTIS CSCL 11/6

A theoretical model has been used to relate the cleavage fracture toughness of the low-alloy steels to their microstructure. The cleavage fracture toughness of low-alloy steels depends upon three metallurgical parameters: the microscopic cleavage strength, the yield strength, and the effective root radius. Variations in fracture toughness with microstructure can be explained through the effect of the microstructure on these parameters. The major objective of this investigation has been the study of the effect of microstructural variables on these parameters, and hence the effect of microstructure on fracture toughness. The theoretical model for the cleavage fracture toughness of the low-alloy steels can be successfully applied provided the assumptions are not strongly violated. This requires low microscopic cleavage strength/yield strength ratio values and low work-hardening rates. Lower temperatures and higher strain rates both favor these conditions. (Modified author abstract) GRA

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N74-34067*# United Aircraft Corp., East Hartford, Conn. Research Labs.

FABRICATION OF ANGLEPLY CARBON-ALUMINUM COMPOSITES Final Report

R. C. Novak Sep. 1974 57 p refs

(Contract NAS3-17784)

(NASA-CR-134703; N911748-9) Avail: NTIS HC $6.00 CSCL 11D

A study was conducted to fabricate and test angleply composite consisting of NASA-Hough carbon base monofilament in a matrix of 2024 aluminum. The effect of fabrication variables on the tensile properties was determined, and an optimum set of conditions was established. The size of the composite panels was successfully scaled up, and the material was tested to measure tensile behavior as a function of temperature, stress-rupture and creep characteristics at two elevated temperatures, bending fatigue behavior, resistance to thermal cycling, and Izod impact response. Author

N74-34068*# National Aeronautics and Space Administration, Washington, D.C.

ON THE DISTRIBUTION AND MIGRATION OF ANTISTATIC AGENTS IN SPECIMENS MADE FROM POLYOLEFINS AND POLYSTYRENE

K. Rombusch and G. Maahs Washington NASA Sep. 1974 24 p refs Transl. into ENGLISH of "Uber die Verteilung und

Migration von Antistatika in Formstucken aus Polyolefinen und Polystyrol" in Die Angew. Makromol. Chem. (Switzerland), v. 34, no. 501, 1973 p 55-70 In GERMAN
(NASA-TT-F-14794) Avail: NTIS HC $4.25 CSCL 11I

Injection-molded sheets are described, which are made of polyolefins and impact-resistant polystyrene containing lithium salts of carboxymethylate ethoxylates, alkane sulfonic acids, and alkyl benzene sulfonic acids. Equilibrium exists immediately after the molding operation between the molecules of the antistatic agents on the surface and those inside the molded objects. The thickness of the surface layer did not significantly change during several weeks of storage. The thickness depended on the type of polymer and on the type and concentration of the antistatic agent used. The thickness increases two to twenty-one fold, depending on the polymer, antistatic agent, and on the concentration of the antistatic agent, and gylcerol. This is attributed to an increase in the rate of diffusion of the antistatic agent due to the presence of glycerol. It is concluded that below the polymer surface of injection-molded objects there is a minimum in the concentration of the antistatic agent, which fills up during extended storage of the test samples. Author

N74-34069*# Battelle Columbus Labs., Ohio.
IMPROVED TOUGHNESS OF REFRACTORY COMPOUNDS
T. R. Wright and D. E. Niesz 11 Oct. 1974 79 p refs
(Contract NAS3-17766)
(NASA-CR-134690) Avail: NTIS HC $7.00 CSCL 11D

The concept of grain-boundary-engineering through elimination of the grain-boundary silicate phase in silicon nitride was developed. The process involved removal of the silica from the nitride powder via a thermal treatment coupled with the use of nitride additives to compensate the remaining oxygen. Magnesium and aluminum nitrides are found to be the most effective additive for use as oxygen compensators. Strength decreases at elevated temperatures are not observed in the alumina containing material. The creep rate of a dual additive sialon composition was two orders of magnitude lower at 1400 C than commercial silicon nitride. A cursory analysis of the creep mechanism indicate that grain-boundary sliding is avoided through elimination of the grain-boundary silicate phase. Author

N74-34070# Columbia Univ., New York. Liquid Metals Research Lab.
REVISION OF HIGH TEMPERATURE AND CRITICAL PROPERTIES OF CESIUM
Surajit DasGupta, Vijay Bhise, D. W. Stuteville, J. W. Chung, and C. F. Bonilla 1973 10 p refs Presented at the 6th Symp. on Thermophys. Properties, Atlanta, 6-8 Aug. 1973
(Contract at(11-1)-3027)
(COO-3027-9; Conf-730851-5) Avail: NTIS HC $3.00

The high-temperature equilibrium vapor and liquid phase densities of cesium reported previously from a tilting capsule test were recalculated with the aid of generalized mathematical relations for the phase densities, instead of a rectilinear diameters line extrapolated from lower temperatures. The critical density and temperature found are 0.420 g/cc and 3686.0 deg R, respectively. In addition, the earlier high-temperature vapor pressure data and critical pressure of cesium by the pressure tube method were checked with the improved equipment now available, obtaining close reverification. The critical pressure was obtained as 1701.3 psia and the critical temperature by this independent method as 3699.1 deg R. Using the average critical temperature of 3692.1 plus or minus 8 deg R, the critical compressibility factor of cesium is calculated as 0.2177.
Author (NSA)

N74-34071# California Univ., Livermore. Lawrence Livermore Lab.
ACOUSTIC EMISSION FROM STRESS RUPTURE AND FATIGUE OF AN ORGANIC FIBER COMPOSITE
M. A. Hamstad and T. T. Chiao 15 Jan. 1974 24 p refs Presented at the Conf. on Composite Reliability, Las Vegas, Nev., 15 Apr. 1974 Sponsored by AEC
(UCRL-74745; Conf-740411-3) Avail: NTIS HC $4.25

A series of tests was carried out to determine the scatter in acoustic emission data gathered during stress rupture and fatigue testing of a simple fiber-reinforced epoxy composite. Single-end organic fiber/epoxy strands were monitored for acoustic emission during tensile tests to failure, stress rupture tests, and dynamic fatigue tests. During the stress rupture and fatigue tests, the plots of summation of acoustic emission counts vs time were found to resemble metal creep curves in that primary, secondary, and tertiary regions could be distinguished. Because of a significant amount of scatter, only a limited correlation can be made between the slope of the summation of acoustic emission in the steady state region and the specimen life during stress rupture and fatigue testing. In addition, flawed specimens were easily sorted out during the tensile tests. These results indicate that acoustic emission data gathered during composite fatigue and stress rupture testing might be useful for life prediction. Author (NSA)

N74-34072# Sandia Labs., Albuquerque, N.Mex.
OPTIMIZATION OF THE THERMAL SHOCK RESISTANCE OF CARBON-CARBON COMPOSITES
T. R. Guess and B. L. Butler 1973 25 p refs Presented at Conf. on Composite Reliability, Las Vegas, Nev., 15 Apr. 1974 Sponsored by AEC
(SLA-73-5728; Conf-740411-2) Avail: NTIS HC $4.25

A three-dimensional micromechanics model was developed to calculate the room temperature, thermal and mechanical properties of carbon-carbon composites whose constituents have anisotropic properties. The model was used, along with the properties of different carbon fibers and pyrocarbon matrices, to determine the fiber-matrix combination, constituent volume fractions, and constituent orientations that maximize expected composite thermal shock resistance. The results indicate that a composite having a low volume fraction of high modulus carbon fibers, arranged in a 3D array, and coated with anisotropic, heat-treated pyrocarbon matrix will have the maximum thermal shock resistance. Confidence in the model was established by good agreement between model predictions and experimental data on actual carbon-carbon composites. Author

N74-34073# Naval Ship Research and Development Center, Annapolis, Md.
CERAMICS FOR GAS TURBINE APPLICATIONS (A STATE-OF-THE-ART SURVEY)
S. J. Dapkunas May 1974 37 p refs
(AD-780440; NSRDC-4199; NSRDC-28-769) Avail: NTIS CSCL 11/2

Silicon nitride and silicon carbide are shown to be the ceramics having the most promise, with major efforts currently under way to develop these materials for use in the near future. Mechanical properties and data on oxidation and hot corrosion have been compiled and presented for comparison with those of currently available superalloys. These comparisons show hot-pressed ceramics to have strength and environmental resistance superior to nickel- and cobalt-base superalloys at elevated temperatures but lacking in impact strength. Reaction-sintered silicon nitride is shown to be a low-strength material. Hot-pressed silicon nitride and silicon carbide are expected to find application in situations where strength and reliability rather than cost are determining factors, whereas reaction-sintered silicon nitride offers distinct advantages when low cost achieved through mass production is of great importance for lower stress applications. (Modified author abstract) GRA

N74-34074# Naval Ship Research and Development Center, Annapolis, Md.
A CALCULATION OF HEAT TRANSFER THROUGH A GRADED CERAMIC COATING
Stanley J. Dapkunas May 1974 29 p refs
(AD-781855; NSRDC-4279) Avail: NTIS CSCL 11/3

A computer calculation was made to determine the change in heat-transfer values for a superalloy tube, having a 0.250-inch outside diameter by 0.150-inch inside diameter, by varying the structure of a five-layer graded cermet coating on the exterior of the tube. Variations in the coating structure were made by changing the thickness and conductivity of individual layers. To compute 672 independent heat-transfer values, 21 different conductivity distributions and 32 different thickness distributions were utilized. The computer-generated values were examined for given thickness distributions as functions of the conductivity distributions. Analysis of these heat-transfer values indicates that equivalent thermal insulation can be provided over a range

of coating thicknesses by controlling the structure of the coating. (Modified author abstract) GRA

N74-34075# Army Foreign Science and Technology Center, Charlottesville, Va.
NEW MATERIALS IN TECHNOLOGY
E. I. Belskii 15 Mar. 1974 21 p Transl. into ENGLISH from the monograph "Novye Materialy v jekhnike" Belarus Publishing Office, 1971 p 158-186
(AD-781214; FSTC-HT-23-318-73) Avail: NTIS CSCL 11/2

The methods of powder metallurgy, consisting of compressing in one way or another and subsequently sintering, the products formed and their properties and uses are discussed. Metal powders and the various processes for pressing the products, and the sintering of cermet materials and the various types of articles produced from them are discussed. Cermet and hard alloy tools are discussed and properties and uses of various compositions are tabulated. Mineral ceramics, including quartz, emery, corundum, carborundum and boron carbide are discussed. Various cermets and their mechanical properties are given and the various types of diamonds and diamond-bearing tools, properties and purposes, are discussed. GRA

N74-34076# Pratt and Whitney Aircraft, East Hartford, Conn.
ADVANCED CERAMIC SEAL PROGRAM, PHASE 1 Final Report, 15 Aug. 1972 - 30 Sep. 1973
P. W. Schlike Apr. 1974 60 p refs
(Contract N00140-73-C-0320)
(AD-781004; PWA-6635) Avail: NTIS CSCL 11/2

Screening of candidate ceramic seal materials was conducted to select the most promising systems for turbine seal component development. Vendor screening coupled with a literature search and preliminary thermal analysis identified five ceramic seal systems and one blade tip system for testing and evaluation in this contract. The ceramic seal materials were divided into two categories (1) insulative ceramic materials which could be applied to a metallic substrate and (2) structural ceramic materials to be mechanically held in place. Yittria stabilized zirconia was selected as the primary insulative ceramic material and reaction sintered silicon nitride was selected as the primary structural ceramic material to be used in these systems. Physical properties measurements of coefficient of thermal expansion, thermal conductivity, and modulus of elasticity were performed on the selected seal materials. Thermal shock, oxidation/erosion and abradability were conducted on the seal and blade tip systems. Analysis of the test results and thermal and stress analysis under advanced engine conditions resulted in the selection of the best graded metal/ceramic system and the best structural system for turbine seal component development. Hot pressed silicon nitride and hot pressed silicon carbide were also analyzed for thermal and stress levels under advanced engine conditions. The recommended systems are: System 3 (yittria/calcia stabilized zirconia graded with a nickel chromium metallic constituent and brazed to a metallic substrate) and hot pressed silicon carbide. Author (GRA)

N74-34077# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROTECTION OF CERTAIN BORIDES FROM OXIDATION IN AIR AT 1200 DEGREES
M. V. Sazanova 24 Jun. 1974 17 p refs Transl. into ENGLISH from the book "Vsesoyuznogo Soveschaniya po Zharostoikim po Krytiyam" USSR, 1972 p 173-181
(FTD Proj. T73-01-11; FTD Proj. T74-01-05)
(AD-781666; FTD-HT-23-1303-74) Avail: NTIS CSCL 11/3

The present work was performed to clarify the possibility of protecting titanium, zirconium, chromium, niobium, hafnium, tantalum, and molybdenum (Mo_2B_5) borides from oxidation in air at 1200 deg using glass-silicide coatings. GRA

N74-34078# TRW, Inc., Cleveland, Ohio.
METAL MATRIX COMPOSITES FOR HIGH TEMPERATURE TURBINE BLADES Final Technical Report, 1 Jan. 1973 - 31 Mar. 1974
William D. Brentnall and Istvan J. Toth 29 Apr. 1974 57 p refs
(Contract N00019-73-C-0202)
(AD-782398; TRW-ER-7634-F) Avail: NTIS CSCL 11/4

Results obtained during the first 12-month's work on a program to develop fiber-reinforced Fe-Cr-Al-Y composites for gas turbine applications at temperatures up to 2400F are discussed. The feasibility of using a powder metallurgy method to fabricate monolayer and multi-ply specimens was demonstrated. Composites with W-1 ThO_2, Mo TZM, SiC and Al_2O_3 continuous filaments were evaluated. Evaluations included thermochemical compatibility studies on composites with uncoated and coated filaments and preliminary stress rupture strength determinations. Author (GRA)

N74-34079# Case Western Reserve Univ., Cleveland, Ohio.
POLYMERIZATION OF CONTROLLED ANISOTROPY POLYMERS ON GRAPHITE FIBERS Final Report, Jan. 1972 - Sep. 1973
Jerome B. Lando Nov. 1973 57 p refs
(Contract F33615-72-C-1171)
(AD-782213; AFML-TR-73-279) Avail: NTIS CSCL 11/4

Graphite fiber reinforced polymeric composites containing oriented polymer matrices have been prepared by the in situ polymerization of monomers epitaxially crystallized onto the fiber surface. All crystallizable substances studied demonstrated an orienting effect such that the direction of most rapid growth corresponds to that of the fiber axis so as to maximize the interaction with the graphite crystal edges. The Nylon 66 system was of primary interest in this study. X-ray diffraction has demonstrated that the matrix morphology corresponds to the polymer chains aligning themselves parallel to the surface of the graphite fiber. Scanning electron microscopy of fracture surfaces has shown excellent adherence between the fiber and matrix, with fracture occurring mostly in the matrix material. Preliminary test results must be considered inconclusive until an improved procedure for preparing composites is developed. GRA

N74-34080# United Aircraft Corp., East Hartford, Conn. Research Labs.
THE EFFECT OF EUTECTIC MICROSTRUCTURES ON THE MECHANICAL PROPERTIES OF CERAMIC OXIDES Final Report, 1 Feb. 1969 - 31 Dec. 1973
Charles O. Hulse and John A. Batt May 1974 137 p refs
(Contract N00014-69-C-0073; NR Proj. 032-516)
(AD-781995; UARL-N910803-10) Avail: NTIS CSCL 11/2

Various experimental techniques for the production of unidirectionally solidified oxide eutectics were examined. These included a modified Bridgman-Starkbarger technique and bottom cooling of melts held in platinum crucibles. It was concluded that the best approach, at least for experimental purposes, was the floating molten zone technique and the successful use of a number of variations of this technique was demonstrated. Many different eutectic systems were directionally solidified and the mechanical properties of the Al_2O_3-ZrO_2 (Y_2O_3), Y_2O_3-ZrO_2, $CaZrO_3$-ZrO_2 and MgO-CaO systems are described in considerable detail. The strength results indicate that oxide materials prepared in this manner can exhibit exceptional strengths and significant increases in toughness at elevated temperatures. The various reasons and requirements for obtaining exceptional mechanical properties in this class of materials are considered. (Modified author abstract) GRA

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N74-34081*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TWO-DIMENSIONAL SIGNAL PROCESSING WITH APPLICATION TO IMAGE RESTORATION
T. Assefi 1 Sep. 1974 18 p refs Prepared in cooperation with the Univ. of Southern Calif., Los Angeles
(Contract NAS7-100; Grant NGL-05-018-044)
(NASA-CR-140074; JPL-TR-32-1596) Avail: NTIS HC $3.00 CSCL 12A

A recursive technique for modeling and estimating a two-dimensional signal contaminated by noise is presented. A two-dimensional signal is assumed to be an undistorted picture.

where the noise introduces the distortion. Both the signal and the noise are assumed to be wide-sense stationary processes with known statistics. Thus, to estimate the two-dimensional signal is to enhance the picture. The picture representing the two-dimensional signal is converted to one dimension by scanning the image horizontally one line at a time. The scanner output becomes a nonstationary random process due to the periodic nature of the scanner operation. Procedures to obtain a dynamical model corresponding to the autocorrelation function of the scanner output are derived. Utilizing the model, a discrete Kalman estimator is designed to enhance the image. Author

N74-34082*# Linguistic Systems, Inc., Cambridge, Mass.
ON THE SOLUTION OF MOLODENSKIY'S PROBLEM WITH THE AID OF A TAYLOR SERIES
M. I. Marych Washington NASA Sep. 1974 16 p Transl. into ENGLISH from "O Reshnii Zadachi Molodenskogo s Pomoshvyu Ryada Teylora", in Geod., Kartografiya i Aerofotos Yemka (USSR), no. 17, 1973 p 26-33
(Contract NASw-2482)
(NASA-TT-F-15739) Avail: NTIS HC $4.00 CSCL 12A

The excitation potential at the physical surface of the earth is reported in a Taylor series in powers of the elevations (heights) of the earth's relief. Formulas are proposed for calculating successive approximations of the excitation potential and the radial components of the earth's gravitational anomaly. It is shown that the problem of analytical continuation of the gravitational potential into the mass of the earth does not limit the practical use of the method proposed. Author

N74-34083# Commissariat a l'Energie Atomique, Grenoble (France).
COMPARISON OF TWO THEORETICAL DECONVOLUTION METHODS
P. Garderet and A. Lecomte 27 Aug. 1973 37 p refs In FRENCH Presented at the Seminar of the Users of Signal Process., Grenoble, France
(CEA-Conf-2583; Conf-730688-1) Avail: AEC Depository Libraries HC $5.00

Two methods, general deconvolution and least squares used by signal processors were compared. Data cover procedures and difficulties encountered in solving such problems. Linear and stationary filters were also discussed. Transl. by E.H.W.

N74-34084# Loughborough Univ. of Technology (England). Dept. of Mathematics.
THE RELATIONSHIP BETWEEN ORDER DEGREE AND COMPLEXITY IN THE HIERARCHICAL THEORY OF SYSTEMS
A. C. Pugh Feb. 1974 13 p refs
(Grant SRC-B/SR/8561)
(MATHS-RES-33) Avail: NTIS HC $4.00

A definition was given of the order, degree, and complexity of a linear-invariant dynamical system S. These numbers play an important role in the hierarchical structures of a system. A complete description of the interrelation between such numerical invariants associated with a system S and its subsystems Si was given. Some new results in the hierarchical theory of systems were obtained. Author (ESRO)

N74-34085# Loughborough Univ. of Technology (England). Dept. of Mathematics.
KOLMOGOROV-SMIRNOV TYPE GOODNESS-OF-FIT STATISTICS FOR GROUPED AND DISCRETE DATA
A. N. Pettitt Jan. 1974 50 p refs Sponsored in part by the Natl. Res. Council of Can.
(MATHS-RES-32) Avail: NTIS HC $5.50

The exact distributions-of the Kolmogorov-Smirnov (K-S) type goodness of-fit statistics Dn, dn(+) and Vn are found when the data is grouped or discrete, and tabulated for particular cases. The distributions are found to differ significantly from the distributions of the statistics for continuous data. The asymptotic distribution was investigated using Monte Carlo methods, and the small sample distributions were seen to converge slowly. Power studies were carried out using the new significance points and compared with Pearson's chi-squared statistics and David's empty cell test. The K-S statistics were superior for the alternatives considered. A FORTRAN program is included to give the distribution of Dn and Dn(+). Author (ESRO)

N74-34086# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Freiburg (West Germany). Inst. fuer Angewandte Mathematik und Mechanik.
UPPER AND LOWER BOUNDS OF SOLUTIONS OF PARABOLIC BOUNDARY VALUE PROBLEMS OF THE FIRST KIND
Dietmar Guderian Porz 24 Sep. 1973 57 p refs In GERMAN; ENGLISH summary
(DLR-FB-73-113) Avail: NTIS HC $6.00; DFVLR, Porz, West Ger. 17,30 DM

A presentation was made of theorems, which by the use of upper and lower bounds, enable one to bracket the solutions u(t,x) of parabolic boundary value problems of the first kind and, on sections of the parabolic boundary, even the first partial derivative with respect to the non-parabolic variable. The distance between the bounds may vary as a function of both x and t. In general, the application of the theorems given requires the knowledge of certain bounds; as compared to published theorems, it is not necessary to satisfy partial differential inequalities but rather only ordinary differential inequalities. In the case of a class of parabolic boundary value problems of the first kind, a simple method is presented, which always yields upper and lower bounds of the corresponding solutions. Author (ESRO)

N74-34087# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
SOLUTION OF LAPLACE'S EQUATION IN TWO DIMENSIONS
G. T. Symm and R. A. Pitfield Jan. 1974 16 p refs
(NPL-NAC-44) Avail: NTIS HC $4.00

A mathematical description of the solution method employed by the ALGOL procedure Laplace is provided, and results for a variety of examples are presented. The examples include an interior Dirichlet problem in a simply-connected domain, an interior mixed boundary value problem in a doubly-connected domain, an exterior Dirichlet problem, and an interior Neumann problem. ESRO

N74-34088# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
GENERALIZED BRANCH AND BOUND: A METHOD FOR INTEGER LINEAR PROGRAMS
E. R. Brocklehurst May 1974 31 p refs
(NPL-NAC-46) Avail: NTIS HC $4.75

The development of the method of generalized branch and bound (GBB) is described. It is compared with ordinary branch and bound (BB) to show how the desirable features of one method may be incorporated in the other. Illustrative examples are given, and the extension to the mixed integer problem is described. Author (ESRO)

N74-34089# Royal Netherlands Meteorological Inst., De Bilt.
FITTING TESTS [AANPASSINGSTROETSEN]
S. Kruizinga 1974 29 p refs In DUTCH; ENGLISH summary
(KNMI-WR-74-7) Avail: NTIS HC $4.50

A study was performed for statistical purposes on fit. A number of tests were analyzed with Monte Carlo methods. It was found that especially the classical tests of fit are hardly useful in making the choice of a specified distribution in the case that a small sample is used. ESRO

N74-34090# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN INTERACTIVE GRAPHICS PROGRAM FOR CALCULATING AND PLOTTING ROOT LOCI M.S. Thesis
Robert J. Gauthier Mar. 1974 126 p refs
(AF Proj. 8219)
(AD-779764; GE/EE/74-4) Avail: NTIS CSCL 12/1

One of the more important tools in the analysis and design of classical control systems is the root locus. This report describes the history of one program (ROOTL) which, as a result of this study, has been modified to run interactively on the Control Data Corporation 274 Interactive Graphics System. The batch version of the program, ROOTL, uses the branch following

technique of Ash and Ash discussed in another paper and is the starting point of this study. The interactive graphics version of the program, GROOTL, uses the same algorithm but has the advantage of allowing the user to work interactively with the program. The user can execute the calculation algorithm, observe the results in the form of a root locus plot on the display screen of the 274 console, and then modify the open-loop transfer function (or any other input data) as desired. (Modified author abstract) GRA

N74-34091# Wisconsin Univ., Madison. Dept. of Computer Sciences.
DISCRETE MECHANICS FOR ANISOTROPIC POTENTIALS
Robert A. LaBudde and Donald Greenspan Jan. 1974 10 p refs Sponsored by NSF
(PB-231811/1; WIS-CS-203-74) Avail: NTIS HC $3.00 CSCL 12A

In previous work, a new type of numerical method for the solution of equations of motion was derived, denoted discrete mechanics, which has the unique property of conserving the additive constants of motion exactly. The discrete mechanics' forces were obtained for the case of a general, separable potential with radial dependences. In the present work, discrete mechanics is extended to include potentials with anisotropy. Author (GRA)

N74-34092# Cornell Univ., Ithaca, N.Y. Dept. of Computer Science.
A CONTINUOUS ANALOGUE ANALYSIS OF NONLINEAR ITERATIVE METHODS
Paul T. Boggs and J. E. Dennis, Jr. Mar. 1974 38 p refs (Grant NSF GJ-40903)
(PB-232090/1; CU-CSD-74-200) Avail: NTIS HC $3.25 CSCL 12A

The paper applies the asymptotic stability theory for ordinary differential equations to Gavurin's continuous analog of several well-known nonlinear iterative methods. In particular, a general theory is developed which extends the Ortega-Rheinboldt concept of consistency to include the widely used finite difference approximations to the gradient as well as the finite difference approximations to the Jacobian in Newton's method. The theory is also shown to be applicable to the Levenberg-Marquardt and finite difference Levenberg-Marquardt methods. Author (GRA)

N74-34093# Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
AN ALGORITHM FOR CONTROL SYSTEM PARAMETER OPTIMIZATION USING FREQUENCY RESPONSE CRITERIA
G. B. Recker and G. M. Lance May 1974 34 p refs (Contract DAAF03-69-C-0014)
(AD-781544; TR-51) Avail: NTIS CSCL 12/1

Feedback control system parameter optimization based upon classical frequency response specifications is studied. The use of frequency response information as the basis for the performance index is shown to be feasible, producing satisfactory results without the necessity of repeated solution of the system differential equations. The optimization is carried out through the use of a pattern search algorithm which was modified specifically for this purpose. Author (GRA)

N74-34094# Brown Univ., Providence, R.I. R. I. Lefschetz Center for Dynamical Systems.
WEAK CONVERGENCE OF SET-VALUED FUNCTIONS AND CONTROL
Zvi Artstein Jun. 1974 39 p refs (Contract N00014-67-A-0191-0009; Grant NSF GP-28931; NR Proj. 041-397)
(AD-781192) Avail: NTIS CSCL 12/1

Weak convergence on the space of integrably bounded set-valued functions is defined. Generalizations of results of weak convergence of real-valued integrable functions are obtained in the set-valued case. The results are applied to the characterization of the continuous dependence of the attainable set of a linear control system on the restraint set. It is shown that the weak convergence of the restraint set is a sufficient condition for the uniform convergence of the attainable set, and under the additional condition of uniform integrability the weak convergence is also a necessary condition. Author (GRA)

N74-34095# Army Research Office, Durham, N.C.
TRANSACTIONS OF THE 19TH CONFERENCE OF ARMY MATHEMATICIANS
Dec. 1973 608 p refs Conf. held at Orlando, Fla., 23-25 May 1973
(AD-781771; AROD-73-3-Pt-2) Avail: NTIS CSCL 12/1

A partial listing of the papers of the Army mathematicians meeting is presented, including: Stability of Stiffened Shells; What you always wanted to know but were afraid to ask; Point singularities in linear elasticity; Optimization of multi-parameter systems through use of a modified desirability function; An orderly approach to reliability systems testing of nuclear weapons; On the initial situation of dynamically induced brittle fracture; Analysis of a constrained laser spot pursuit problem; Some mathematical difficulties arising from an inviscid model of jet dynamics. GRA

N74-34096# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FREQUENCY CHARACTERISTICS OF REGRESSION FILTERS
I. I. Polyak 25 Jun. 1974 11 p Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 308, 1973 p 51-59
(AD-781669; FTD-HC-23-2164-74) Avail: NTIS CSCL 12/1

When evaluating observations made for an equidistant system of points, it is frequently necessary to smooth a series of measurements by certain linear transformations. Such a process may be used when analyzing time series, where smoothing makes it possible to avoid spectrum distortion (so called overlapping of frequencies). Different smoothing formulas used for this purpose are obtained as a rule when evaluating the free term of a polynomial using the method of least squares. Several such formulas are given in another paper which were derived by means of polynomials which were orthogonal on a discreet point system. The general form of the smoothing formulas are given for a polynomial power of no greater than five and their frequency characteristics are obtained. GRA

N74-34097# Naval Postgraduate School, Monterey, Calif.
ON THE AXIOMATIC FOUNDATIONS OF DIMENSIONAL ANALYSIS
Theodore H. Gawain May 1974 39 p refs
(AD-781383; NPS-57GN74051) Avail: NTIS CSCL 12/1

The paper reformulates the basic axioms of dimensional analysis so as to clear up some deeply entrenched misconceptions relating to the nature of physical dimensions and generalized units. Certain novel relations are thereby discovered which although unorthodox are nevertheless useful and correct. It is shown how various systems of natural units can be constructed so as to embody the same logical structure that characterizes some given system of fixed units. The important fact is brought out that every physical equation which is valid in some given system of units remains valid if all quantities be converted into any other system which embodies the same logical structure. (Modified author abstract) GRA

N74-34098# State Univ. of New York, Buffalo. Statistical Lab.
TIMESBOARD: A TIME SERIES PACKAGE
M. Pagano and E. Parzen Dec. 1973 7 p refs (Contract N00014-72-C-0508)
(AD-781871; TR-3) Avail: NTIS CSCL 12/1

TIMESBOARD is a collection of subroutines designed to aid the analyst in model identification, parameter estimation and prediction of time series. When competing algorithms were available for a particular task, the one with the most favorable numerical characteristics was chosen. Author (GRA)

N74-34099# Naval Postgraduate School, Monterey, Calif.
SOME METHODS FOR APPROXIMATING FUNCTIONS OF SEVERAL VARIABLES Technical Report, Feb. - Mar. 1974
Richard Franke May 1974 61 p refs
(AD-781369; NPS-53FE74051) Avail: NTIS CSCL 12/1

Some methods of approximating discrete functions of several variables were investigated. The principal goal was a suitable approximation for aerodynamic and infrared signature data for use in real time hybrid computer simulations. The main thrust is toward approximation by sums of functions of fewer variables. Two computer programs are given, and a number of comparisons

between three types of approximations are given. It is decided that no method for determining, a priori, the kind of approximation which will yield suitable results is known, except in special cases. Author (GRA)

N74-34100# Illinois Univ., Urbana. Coordinated Science Lab.
CONTROLLABILITY POLE PLACEMENT AND STABILIZABILITY IN LARGE SCALE COMPOSITE SYSTEMS
U. Ozguner and W. R. Perkins May 1974 44 p refs
(Contract DAAB07-72-C-0259; Grant AF-AFOSR-2570-73)
(AD-781266; R-648; UILU-ENG-74-2212) Avail: NTIS CSCL 12/1

The work gives some preliminary results related to research on Large Scale Composite (LSC) systems. An interconnected system model is considered. Each subsystem is assumed to be linear, time invariant, and have both local inputs and interaction inputs from other subsystems. The main question is what can be done without lumping all subsystems into one large system model, and what can be done by each subsystem using local observations and local control inputs alone. Results on controllability, pole placement and stabilizability are given for the general LSC system and the chain structure. (Modified author abstract) GRA

N74-34101# Army Foreign Science and Technology Center, Charlottesville, Va.
MARKOV PROCESSES WITH A LARGE NUMBER OF LOCALLY INTERACTING COMPONENTS: THE EXISTENCE OF A LIMIT PROCESS AND ITS ERGODICITY
R. L. Dobrushin 5 Mar. 1974 34 p refs Transl. into ENGLISH from Probl. Peredachi Inform. (USSR), v. 7, no. 2, 1971 p 70-87
(AD-781212; FSTC-HT-23-265-73) Avail: NTIS CSCL 12/1

Continuous-time Markov processes whose phase space elements comprise a set of a large number of locally interacting components are examined. These components are assumed to be in one-to-one correspondence with the points of a discrete lattice in space. These processes are investigated via a transition to the limit case when the number of components is infinite. GRA

N74-34102# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
A GUIDE TO SEARCH PROCEDURES FOR UNCONSTRAINED FUNCTION MINIMIZATION PROBLEMS
H. W. Sorenson 21 Dec. 1973 70 p refs
(Contract F04701-73-C-0074)
(AD-781782; TR-0074(4901-03)-2; SAMSO-TR-74-138) Avail: NTIS CSCL 12/2

The report presents a statement and brief discussion of a number of numerical search procedures that have been proposed for finding the minimum of a nonlinear function of n variables. Both direct search and gradient search methods are presented. (Modified author abstract) GRA

N74-34103# Illinois Univ., Urbana. Coordinated Science Lab.
MULTIPLE FAULT DIAGNOSIS IN COMBINATIONAL NETWORKS
Charles Wei-Yuan Cha Jun. 1974 123 p refs
(Contract DAAB07-72-C-0259)
(AD-781325; R-650; UILU-ENG-74-2215) Avail: NTIS CSCL 09/2

A new concept, the prime fault, is introduced for the study of multiple fault diagnosis in combinational logic networks. It is shown that every multiple fault in a network can be represented by a functionally equivalent fault with prime faults as its only components. The use of prime faults greatly simplifies multiple fault analysis and test generation. GRA

N74-34104# Naval Weapons Center, China Lake, Calif.
DISCRETE SEQUENTIAL SEARCH WITH FALSE ALARMS
Edward A. Fay Jun. 1974 25 p refs
(AD-781637; NWC-TP-5647) Avail: NTIS CSCL 12/2

The report generalizes previous work on discrete sequential search for a single stationary object by Black and by Smith and Walsh. In the case treated by Black, false alarm probabilities are zero. In the case treated by Smith and Walsh, they are allowed to be positive but are required to be constant from location to location, as are also the detection probabilities. If detection probabilities are allowed to vary with location but false alarm probabilities are constant, the present report shows how to construct a sequential search policy which, for each n, maximizes the probability of correctly locating the object within the first n steps. (Modified author abstract) GRA

N74-34105# State Univ. of New York, Buffalo. Statistical Lab.
AN ALGORITHM FOR OPTIMIZATION UNDER LINEAR CONSTRAINTS
M. Pagano Jun. 1974 9 p refs
(Contract N00014-72-C-0508)
(AD-781875; TR-12) Avail: NTIS CSCL 12/1

An algorithm is proposed for parameter estimation when certain linear constraints are placed on the parameter space. It presupposes a model which admits best asymptotically normal estimators. Author (GRA)

N74-34106# Wisconsin Univ., Madison. Mathematics Research Center.
A PERTURBATION THEOREM FOR SUPERLINEAR BOUNDARY VALUE PROBLEMS
Antonio Ambrosetti May 1974 22 p refs Sponsored in part by CNR
(Contract DA-31-124-ARO(D)-462)
(AD-780650; MRC-TSR-1442) Avail: NTIS CSCL 12/1

The perturbation in critical point theory is studied. Applications are made to superlinear boundary value problems. Author (GRA)

N74-34107# Wisconsin Univ., Madison. Mathematics Research Center.
A NOTE ON THE APPLICATION OF STATIONARY STOCHASTIC PROCESSES FOR MODELING OF SPACE SERIES
M. S. Phadke and S. M. Wu May 1974 12 p refs
(Contract DA-31-124-ARO(D)-462; Grant NSF GP-40381)
(AD-780647; MRC-TSR-1431) Avail: NTIS CSCL 12/1

Two sided moving average representations are necessary for describing stationary stochastic systems with space as index. The report discusses the noncanonical factorization of the spectral density function needed for such representations. Author (GRA)

N74-34108# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
SOME CONTRIBUTIONS TO FIXED SAMPLE AND SEQUENTIAL MULTIPLE DECISION SELECTION AND RANKING
Deng-Yuan Huang May 1974 78 p refs
(Contract N00014-67-A-0226-0014)
(AD-780906; Mimeograph-Ser-363) Avail: NTIS CSCL 12/1

The report makes some contributions to the subset selection procedures - both for the fixed sample and the sequential case. Chapter 1 deals with some subset selection procedures for binomial populations in terms of the entropy functions, which is different from the usual selection problem in terms of the success probabilities. In Chapter 2, some fixed sample optimal subset selection procedures are discussed for model 1 and 2 problems in the analysis of variance in treatments versus control, and a method for constructing some subset selection procedures is derived. Chapter 3 discusses a method for constructing some sequential subset selection procedures and some optimal sequential subset selection procedure in treatments versus control. An upper bound on the expected sample size for Bechhofer-Kiefer-Sobel sequential selection procedure with indifference zone approach is also derived. Author (GRA)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N74-34109*# City Coll. of the City of New York.
INVESTIGATION OF MODELS FOR LARGE-SCALE METEOROLOGICAL PREDICTION EXPERIMENTS Final Report

Jerome Spar 1 Oct. 1974 10 p refs
(Grant NGR-33-013-086)
(NASA-CR-139692) Avail: NTIS HC $4.00 CSCL 04B

The feasibility of extended and long range weather prediction by physical and dynamical methods was investigated in the following research projects: (1) spectral energy balance; (2) annual cycles of surface heat balance and temperature over North America; and (3) atmospheric response to sea surface temperature anomalies. A.A.D.

N74-34110# Environmental Protection Agency, Research Triangle Park, N.C.
ATMOSPHERIC EMISSIONS FROM THE PULP AND PAPER
Sep. 1973 145 p refs
(EPA-450/1-73-002) Avail: Air Pollution Tech. Inform. Center, Environ. Protection Agency, Res. Triangle Park, N. C. 27711; SOD HC $1.30

Information is presented on the nature and quantities of the atmospheric emissions from chemical pulping operations, principally the Kraft process. Principal sources of information were a comprehensive questionnaire sent to all the pulp mills, special NCASI studies reported in technical bulletins, other literature sources, and a field sampling program conducted by EPA. Control techniques are described and emission ranges reported for each of the operations involved in the chemical pulping processes. Author

N74-34111# National Weather Service, Silver Spring, Md.
NUMERICAL WEATHER PREDICTION ACTIVITIES
Aug. 1974 27 p
Avail: NTIS HC $4.50

The conversion of computer codes from the CDC 6600 system to the IBM 360/195 system is described including the modifications to the operational model systems. Spectral analysis techniques are discussed. F.O.S.

N74-34112# National Environmental Satellite Service, Washington, D.C. Meteorological Satellite Lab.
USE OF GEOSTATIONARY-SATELLITE CLOUD VECTORS TO ESTIMATE TROPICAL CYCLONE INTENSITY
Carl O. Erickson Sep. 1974 41 p refs
(NOAA-TM-NESS-59) Avail: NTIS HC $5.25

Polynomial-fitting techniques were applied to the fields of high-cloud vectors over tropical cyclones to yield numerical calculations of divergence, vorticity, and other parameters. The correlation between maximum low-level wind speed and the parameter mean divergence/vertical shear is approximately +0.6 which is statistically significant. The polynomial-fitting technique, requires that 12 or more vectors be distributed over at least 3 quadrants of the storm. Also cyclone intensity is related to certain cloud configurations or flow patterns. Author

N74-34113# National Weather Service, Silver Spring, Md. Techniques Development Lab.
A COMPARISON BETWEEN THE SINGLE STATION AND GENERALIZED OPERATOR TECHNIQUES FOR AUTOMATED PREDICTION OF PRECIPITATION PROBABILITY
Joseph R. Bocchieri Sep. 1974 23 p refs
(NOAA-TM-NWS-TDL-53) Avail: NTIS HC $4.25

The single station and generalized operator techniques for forecasting probability of precipitation (PoP) are compared. MOS (model output statistics) is used to develop the PoP forecast equations. The single station and generalized operator PoP forecast systems are comparatively verified on independent data. The verifications indicate that the generalized operator technique is better than the single station technique. It is concluded that the generalized operator technique will continue to be used in developing operational PoP equations. Author

N74-34114*# Aeronautical Research Associates of Princeton, Inc., N.J.
THE CHEMISTRY AND DIFFUSION OF AIRCRAFT EXHAUSTS IN THE LOWER STRATOSPHERE DURING THE FIRST FEW HOURS AFTER FLY-BY
Glenn R. Hilst Jul. 1974 77 p refs
(Contract NAS1-12475)
(NASA-CR-132514; ARAP-216) Avail: NTIS HC $4.00 CSCL 04A

An analysis of the hydrogen-nitrogen-oxygen reaction systems in the lower stratosphere as they are initially perturbed by individual aircraft engine exhaust plumes was conducted in order to determine whether any significant chemical reactions occur, either among exhaust chemical species, or between these species and the environmental ozone, while the exhaust products are confined to intact plume segments at relatively high concentrations. The joint effects of diffusive mixing and chemical kinetics on the reactions were also studied, using the techniques of second-order closure diffusion/chemistry models. The focus of the study was on the larger problem of the potential depletion of ozone by supersonic transport aircraft exhaust materials emitted into the lower stratosphere. Author

N74-34115# Dow Chemical Co., Freeport, Tex.
WARM FOG DISPERSAL TESTS WITH GLYCERINE AT GREENBRIAR VALLEY AIRPORT, LEWISBURG, WEST VIRGINIA Final Report, Aug. - Dec. 1973
J. M. McDuff, Z. J. Moore, and J. V. Goode Dec. 1973 52 p refs
(Contract DOT-FA72WA-2727)
(AD-776135; FAA-RD-74-1; TOPR-178-6-186) Avail: NTIS HC $3.75

Field tests designed to measure the effectiveness of glycerine as a warm fog dispersal agent were conducted at the Greenbrier Valley Airport, Lewisburg, West Virginia, during the month of September, 1973. The tests were designed to provide a quantitative relationship between the amount of glycerine used and the resultant improvement in visibility. Problem areas such as controlled particulation, improved analytical evaluation, and more accurate targeting capability were emphasized. The test results verified that isolated areas of improved visibility were produced by the seeding experiments. However, the test results also indicate that the effects produced by shear winds will be an overriding factor in determining the quantity of glycerine required to open a fogged in airport. Author

N74-34116# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION IN BELGIUM DUE TO SULFUR OXIDES AND SMOKE DURING THE PERIOD 1 APRIL 1971 TO 31 MARCH 1972 [LA POLLUTION ATMOSPHERIQUE PAR LES OXYDES DE SOUFRE ET LA FUMEE EN BELGIQUE AU COURS DE LA PERIODE DU 1 AVRIL 1971 AU 31 MARS 1972]
A. Derouane, J. Grandjean, M. Legrand, and G. Verduyn 1973 87 p refs IN ENGLISH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
(Publ-Ser-A-84) Avail: NTIS HC $7.50

Sulfur dioxide and smoke concentration data recorded in various Belgian stations in order to determine the amount of atmospheric pollution are given for the period 1 April 1971 to 31 March 1972. ESRO

N74-34117# Institut Royal Meteorologique de Belgique, Brussels.
POTENTIAL EVAPOTRANSPIRATION OF THE HYDROGRAPHIC BASINS IN BELGIUM [L'EVAPOTRANSPIRATION POTENTIELLE DES BASSINS HYDROGRAPHIQUES EN BELGIQUE]
Franz Bultot and Gerard L. Dupriez 1974 64 p refs In FRENCH
(Publ-Ser-A-85) Avail: NTIS HC $6.25

The daily evaporation of a free water layer and the potential daily evapotranspiration of a water basin were estimated. Parameters of the basic formulas used were adopted to study the climatic conditions in Belgium. ESRO

N74-34118# World Meteorological Organization, Geneva (Switzerland).
REPORT OF THE SIXTH SESSION OF THE TROPICAL EXPERIMENT BOARD Global Atmospheric Research Program
Apr. 1974 43 p Prepared jointly with Intern. Council of Sci. Unions
(GARP-Spec-Rept-12) Avail: NTIS HC $5.25; WMO, Geneva

Following a general status report of the Tropical Experiment Board for the GARP Atlantic Tropic Experiment (GATE), the final platform commitments and operational plans (support aircraft,

telecommunications, ship) were discussed. The status of the World Weather Watch and exchange of scientific personnel were noted and a report on the NAVAID wind finding system was presented. The data management and scientific subprograms were briefly summarized and post-GATE activities discussed. ESRO

N74-34119# Royal Netherlands Meteorological Inst., De Bilt.
VERIFICATION OF 2 AND 3-DAY WEATHER FORECASTS OVER THE PERIOD 1955 - 1973 [EEN VERIFICATIE VAN 2- EN 3- DAAGSE WEERSVERWACHTINGEN OPGESTELD IN DE PERIODE 1955 - 1973]
H. C. Bijvoet 1974 25 p In DUTCH
(KNMI-V-255) Avail: NTIS HC $4.25

Numerical data on results of multiday forecasts over the period 1955 to 1973 was collected. An interpretation of these data was not given for the period from 1969 to 1973, but the significant difference between the two-day forecasts in the years from 1955 to 1956, and the years from 1969 to 1973 was highlighted. Numerical current pattern forecasts contain more information on future weather than the classic method can produce, but the latently available information in numerical products can only be obtained by applying an adapted methodology. ESRO

N74-34120# Royal Netherlands Meteorological Inst., De Bilt.
INVESTIGATION OF WINTER WEATHER IN THE NETHERLANDS [ONDERZOEK NAAR HET OPTREDEN VAN WINTERWEER IN NEDERLAND]
F. Ijnsen Mar. 1974 68 p refs In DUTCH; ENGLISH summary
(KNMI-WR-74-2) Avail: NTIS HC $6.50

A method was developed for making a classification of all winters since the year 1200 A.D. in the Netherlands. For that purpose, a frost number 5 was developed; the frost occuring every winter can be fixed on a scale of 100 units, for winter season with frost V = 0, and for the most severe winter V = 100, with a probability P(V) = 0.005. The frost numbers in the period 1850-1916 are correlated with the temperature coefficients according to Easton. With this relationship, it was possible to transform all the Easton numbers since 1200 into frost numbers, and develop a homogeneous time series. ESRO

N74-34121# Royal Netherlands Meteorological Inst., De Bilt.
DESCRIPTION AND APPLICATION POSSIBILITIES OF MEAN TOPOGRAPHIES OF THE 500 mbar LEVEL DEPENDENT ON CIRCULATION TYPES [BESCHRIJVING EN TOEPASSINGSMOGELIJKHEDEN VAN GEMIDDELDE TOPOGRAFIEEN VAN HET 500 mbar-VLAK IN AFHANKELIJKHEID VAN CIRCULATIETYPEN]
W. Vandijk, F. H. Schmidt, and C. J. E. Schuurmans 1974 161 p refs In DUTCH; ENGLISH summary
(KNMI-WR-74-3) Avail: NTIS HC $11.25

Maps and descriptions of the mean topographies of the 500 mb level for each Grosswetterlage (GWL) and for the four seasons are presented. The GWL is a situation of the troposphere above a certain area, in which the position as well as the extent of the determining high and low pressure regions remain near-constant for at least a couple of days. A vast region extending from the coastal areas of the North-American continent to the Ural mountains was considered. It is demonstrated that the geostrophic vorticity could be used as a satisfactory parameter to distinguish the GWL. Several statistical tests were applied to test the significance of the mean values. The possible role of the GWL in general circulation is considered. ESRO

N74-34122# Royal Netherlands Meteorological Inst., De Bilt.
TEMPERATURE INVERSIONS. AN INVESTIGATION OF THE ORIGIN, THE BEHAVIOR AND THE OCCURRENCE IN THE LOWEST LAYERS OF THE ATMOSPHERE ABOVE THE NETHERLANDS [TEMPERATUURINVERSIES. EEN ONDERZOEK NAAR ET OUTSTAAN, HET GEDRAG EN HET VOORKOMEN VAN INVERSIES IN DE ONDERSTE LAGEN VAN DE ATMOSFEER BOVEN NEDERLAND]
H. Daan 1974 95 p refs In DUTCH; ENGLISH summary
(KNMI-WR-74-6) Avail: NTIS HC $7.75

The temperature inversions observed in 1971 are classified according to the following types: (1) radiation inversions; (2) convection inversions; (3) subsidence inversions; (4) turbulence inversions; (5) cold front; (6) warm front inversion; (7) 'sticking layer' inversion; and (8) warm sector inversions; Frequency distributions are given for each type, and tables are presented which show the occurrences as functions of season, time of day, and certain meteorological parameters. Remarks are on the representativity in space and time of observations, and an attempt is made to relate temperature inversions to the occurrence of air pollution. ESRO

N74-34123# Royal Netherlands Meteorological Inst., De Bilt.
THE INCLUSION OF LATENT HEAT IN A THREE-LEVEL MODEL WITH FILTERED EQUATIONS AND ITS INFLUENCE UPON THE DEVELOPMENT OF DEPRESSIONS
L. C. Heijboer and A. W. denExterBlokland 1974 64 p refs
(KNMI-WR-74-11) Avail: NTIS HC $6.25

A moist atmospheric model in which latent heat is taken into account, is dealt with. The model was based on the three fundamental equations: the vorticity equation, the thermodynamic equation, and the continuity equation, with a heating term in the thermodynamic equation. While the equations are linear in the relevant terms, expressions for the difference between the solutions of the moist model, and the dry model can be found by simply substracting the vorticity and the thermodynamic equation of the dry model from the corresponding equations of the moist model. ESRO

N74-34124# Royal Netherlands Meteorological Inst., De Bilt.
SIGNIFICANCE OF WIND DIRECTION VARIABILITY FOR ESTIMATING THE LOCATION OF THE CONTAMINATED SECTOR AFTER ACCIDENTS WITH NOXIOUS MATERIALS [DE BETEKENIS VAN DE VERANDERLIJKHEID VAN DE WINDRICHTING VOOR SCHATTINGEN VAN DE LIGGING VAN HET BESMETTE GEBIED NA ONGEVALLEN MET SCHADELIJKE STOFFEN]
W. N. Lablans and P. J. Rijkoort 1974 21 p refs In DUTCH; ENGLISH summary
(KNMI-WR-74-12) Avail: NTIS HC $4.25

A method is described for the assessment of the magnitude and the orientation of a sector in which an emission of noxious materials has taken place as a result of an accident. The dispersion of noxious gases after an accidental discharge is determined by the nature and the duration of the accident, and the meteorological circumstances. Meteorological advice with respect to such emissions is split up into two stages. The first step is a rapid determination of a sector outside of which the atmosphere will not be contaminated with an indicated high probability. Thereafter, investigations were made of how the contamination proceeds with time within the indicated sector. The method described is based on statistical data on the persistance of wind direction. ESRO

N74-34125# Royal Netherlands Meteorological Inst., De Bilt.
SYNOPTIC AND UPPER AIR OBSERVATIONS, VOLUME 18, 1973
1974 396 p In ENGLISH and DUTCH
(KNMI-142-18) Avail: NTIS HC $23.00; Roy. Neth. Meteorol. Inst. F 12,50

Observations recorded at meteorological stations in the Netherlands on board light vessels, and from an automatic weather station on a platform in the North Sea for 1973 are tabulated. Data concerning pressure, temperature, relative humidity, and wind in the upper air were obtained by using a radiosonde. Upper air wind direction and velocity were obtained from radar measurements. ESRO

N74-34126# R and D Associates, Santa Monica, Calif.
HISTORICAL CLIMATOLOGY Final Technical Report
Leona M. Libby Feb. 1974 95 p refs
(Contract F44620-73-C-0029; ARPA Order 1964)
(AD-780121; RDA-TR-2901-001; AFOSR-74-0821TR) Avail: NTIS CSCL 04/2

A methodology for evaluation of past climates in historic times has been examined from a theoretical basis and its evaluation has been initiated. The principle is that the ratios of stable isotopes in a tree depend on the temperature at which its wood is manufactured as well as on the temperature at which precipitation, which nourishes the tree is produced. By measuring stable isotope ratios in a chronological sequence of dated tree rings, changes

in climate may be evaluated. A tree has been so measured for the years 1700-1950 and compared with the thermometer record for those years to obtain phenomenological (numerical) temperature coefficients for the ratios of hydrogen, carbon, and oxygen. A second tree has been measured for the years 1500-1800 and found to show the low temperatures of the Little Ice Age with warm brief intervals at about 1570, 1650, 1730 and 1790. A theoretical study of various aspects of the total carbon inventory on the earth's surface has been initiated. Author (GRA)

N74-34127# Technology Service Corp., Santa Monica, Calif.
THE APPLICATION OF REPRO-MODELING TO THE ANALYSIS OF A PHOTOCHEMICAL AIR POLLUTION MODEL Final Report
Alan Horowitz, William S. Meisel, and David C. Collins Dec. 1973 107 p refs
(Contract EPA-68-02-1207)
(PB-231667/7; EPA-650/4-74-001) Avail: NTIS HC $4.50 CSCL 13B

Several physical models which simulate the impact of emissions and meteorology on the creation and dispersion of photochemical smog was developed. Repro-modeling is defined as the analysis and replication of the input/outputs characteristics of the model. A study of the application of repro-modeling to the SAI model developed for the Los Angeles Basin is described. The major objectives of the study were: (1) a feasibility test of the repro-modeling approach; (2) a limited interpretation of the implications of the model; and (3) an efficient repro-model program which duplicates input/output relationships of the original model. GRA

N74-34128# Argonne National Lab., Ill. Energy and Environmental Studies Div.
INTERAGENCY COOPERATION IN COMPREHENSIVE URBAN PLANNING AND AIR QUALITY MAINTENANCE Final Report
Allen S. Kennedy, Frank Beal, Richard Spicer, Charles Thurow, and William Toner Mar. 1974 29 p Sponsored by EPA
(PB-231993/7; EPA-450/3-74-027) Avail: NTIS HC $4.50 CSCL 13B

The report is a study of the interagency relationships among state and local air pollution control agencies and comprehensive planning agencies. The study was conducted as a joint effort of the Argonne National Laboratory, Energy and Environmental Studies Division, and the American Society of Planning Officials for the United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Land Use Planning Branch. Staff from EESD and the ASPO research team developed a questionnaire that explored the potential for planning agencies and air pollution control agencies working together to achieve air quality goals. The questionnaire was then submitted to the 900 public planning agencies subscribing to the Planning Advisory Service of ASPO. GRA

N74-34129# Systems Technology Associates, Inc., Falls Church, Va.
DEVELOPMENT AND FABRICATION OF A MASS EMISSION DATA AND CONTROL SYSTEM FOR THE STATIONARY SOURCE SIMULATOR Environmental Protection Technology Series
Paul Dimouro, Ron Reiner, and Hal Dodds Oct. 1973 166 p refs
(Contract EPA-68-02-0658)
(PB-232013/3; EPA-650/2-73-009) Avail: NTIS HC $11.50 CSCL 13B

A mass emission data and control system was developed to provide the primary run-time control and data acquisition functions for a large closed loop wind tunnel, used to simulate the conditions found in smoke stacks of various industries but with carefully controlled conditions. Experiments conducted in tye test sections of the source simulator' can involve sampling, analytical equipment development, or testing. The temperature, velocity and humidity can be programmed to follow a present time value curve to simulate cyclic operations. The report describes system, technical, and test specifications and system components and software. Extensive flow charts and narratives describe the structure and content of the software. GRA

N74-34130# Hawaii Univ., Honolulu. Dept. of Meteorology.
A ROLE OF THE TROPICAL UPPER TROPOSPHERIC TROUGH IN EARLY SEASON TYPHOON DEVELOPMENT
James C. Sadler May 1974 56 p refs
(Contract N66314-73-C-1770; WF52551713)
(AD-782364; UHMET-73-04;
ENVPREDRSCHF-Tech-Paper-9-74) Avail: NTIS CSCL 04/2

During each of three occasions in June of 1971 that the Tropical Upper Tropospheric Trough (TUTT) extended into the western North Pacific along 15N, a typhoon developed in the low-level trough between 5N and 10N. Detailed analyses of the upper-tropospheric wind field during the early stages of the three typhoons -- Freda, Gilda, and Harriet -- are used to develop a synoptic model which describes the role of the TUTT in early season typhoon development. Author (GRA)

N74-34131# National Highway Traffic Safety Administration, Washington, D.C. Office of Administrative Services.
MOTOR VEHICLE EMISSIONS: A BIBLIOGRAPHY WITH ABSTRACTS
Mar. 1974 249 p refs
(PB-232235/2; DOT-HS-801-133) Avail: NTIS HC $6.00 CSCL 13B

The documents cited in this publication are in the NHTSA Technical Reference Division collection. Since this collection was established in 1967 most of the publications cited bear a publication date of 1967 or later. Citations and abstracts are those that have previously appeared in the NHTSA publication Highway Safety Literature. GRA

N74-34132# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
AIR POLLUTION ASPECTS OF EMISSION SOURCES: SURFACE COATINGS-THEIR PRODUCTION AND USE: A BIBLIOGRAPHY WITH ABSTRACTS
Mar. 1974 73 p
(PB-232501/7; EPA-450/1-74-005) Avail: NTIS HC $3.75 CSCL 11C

The Air Pollution Technical Information Center (APTIC) of the Office of Air Quality Planning and Standards prepared, selected, and compiled the approximately 235 abstracts in this bibliography. The entries are grouped into the following subject categories: (1) emission sources, (2) control methods; (3) measurement methods, (4) air quality measurements; (5) atmospheric interactions; (6) basic science and technology, (7) effects-human health; (8) effects materials, (9) effects-economic; (10) standards and criteria, (11) legal and administrative; and (12) social aspects. The subject and author indexes refer to the abstracts by category letter and accession number. The author index lists all authors individually; primary authorship is indicated by an asterisk. GRA

N74-34133# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
DIAGNOSTIC TESTS OF MODELS FOR THE THERMAL STRUCTURE OF THE NON-PRECIPITATING CONVECTIVE BOUNDARY LAYER M.S. Thesis
Douglas A. Moore and Alan K. Betts Apr. 1974 74 p refs
(Grants NSF GA-33182; NSF GA-36323)
(PB-231780/8; AS-Paper-217) Avail: NTIS HC $6.75 CSCL 04B

The paper presents a diagnostic study of the two models proposed by Betts (1973a). The first was a model for a well mixed sub-cloud layer capped by a more stable transition layer. The downward heat flux at the base of this transition layer is here estimated from the thermal structure of the layer to be 15-25% of the surface sensible heat flux. The second model was a model for a two layer-rate structure for the cumulus layer. A sensitivity analysis is conducted on this lapse-rate model. The model results compare favorably with observational evidence from the BOMEX, ATEX, and VIMHEX tropical field experiments. The parameterization of entrainment is examined through model calculations, and by radiosonde ascents into cloud. It is found that the scaling of entrainment by the depth of the layer of conditional instability (as used in the model) is satisfactory; but that other depths of the cloud layer could be used equally well. Author (GRA)

N74-34134# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
THE LARGE-SCALE RESPONSE OF THE TROPICAL ATMOSPHERE TO RADIATIVE HEATING M.S. Thesis
Bruce A. Albrecht and Stephen K. Cox Mar. 1974 89 p refs
(Grant NSF GA-36302)
(PB-231779/0; AS-Paper-215) Avail: NTIS HC $7.50 CSCL 04B

A large-scale diagnostic model is used to determine the effect of various diabatic forcing functions on tropospheric motions. Many of the features of the tropospheric equatorial waves are duplicated by using the observed difference in heating between the trough and the ridge of the waves in the model. The structure of waves forced by the observed differences in radiative heating was determined. The atmospheric response was similar to the layered meridional wind structure observed during the Line Island experiment. When the radiative heating was combined with convective heating, the vertical structure of the forced motions was found to be very sensitive to the phase difference between the convective and the radiative heating. The amplitude of the meridional wind perturbations at 200 mb varied from 1 m/sec for the case when radiatively active upper tropospheric clouds were centered over the convective heating to 5.5 m/sec when the cloud was centered a half of wavelength from the convective heating. (Modified author abstract) GRA

N74-34135# Calspan Corp., Buffalo, N.Y.
TECHNICAL EVALUATION OF EMISSION CONTROL APPROACHES AND ECONOMICS OF EMISSION REDUCTION REQUIREMENTS FOR VEHICLES BETWEEN 6000 AND 14000 POUNDS GVW
L. Bogdan, A. Burke, and H. Reif Nov. 1973 344 p refs
(Contract EPA-68-01-0463)
(PB-232773/2; EPA-460/3-73-005) Avail: NTIS HC $7.50 CSCL 21G

An account is presented of a two-part study concerned with the reduction of emissions from the group of vehicles populating the 6,000-14,000 pound GVW range. In the technical evaluation study, state-of-the-art control technology is used to synthesize control system strategies and to estimate their control effectiveness when applied to this class of vehicles. The economic analysis study develops the relationships between the different control strategies and the costs associated with their implementation. A description is given of a computer program developed to assess the impact on emissions and to evaluate implementation costs of the several control strategies. Numerical results are presented. GRA

N74-34136# Carnegie-Mellon Univ., Pittsburgh, Pa.
NUMERICAL ASPECTS OF POLLUTION ABATEMENT Final Report
Kenneth O. Kortanek 12 Jun. 1974 17 p refs
(Grant NSF GK-31833)
(PB-232781/5) Avail: NTIS HC $4.00 CSCL 13B

Mathematical models were developed for optimizing air pollution abatement policies originally stemming from problems encountered in the Pittsburgh area. The basic problem is to determine how much should polluters reduce their emission rates in order to achieve desirable air quality throughout a geographic region according to any of a number of policy goals. Consequently, various cost effective air pollution control strategies can be suggested for a given geographic region, termed selective abatement procedures. New computational schemes and computer codes were developed. Results of the project were applied to air pollution abatement problems in Allegheny County, and contributions were made to the formation of recent legislation on air pollution control in the county. GRA

N74-34137# Battelle Columbus Labs., Ohio.
DEVELOPMENT OF CROSS-MEDIA EVALUATION METHODOLOGY, VOLUME 1 AND 2 Final Report
Howard Reiguam, Norbert Dee, and Paul Choi 15 Jan. 1974 224 p refs
(Contract EQC-315)
(PB-232414/3) Avail: NTIS HC $5.75 CSCL 13B

A preliminary effort to develop a methology to evaluate cross-media impacts is reported. The study develops an environmental degradation index for each possible combination of pollution control measures by plant or industry. The index is based upon estimations of the potential damage accounted with the process and the relative importance of the medium affected. The methodology combines a detailed evolution of pollution emissions with a Delphic procedure for weighing the impact of the pollution on the various media. GRA

N74-34138# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPECTRAL ANALYSIS OF METEOROLOGICAL FIELDS
K. Sinolekka 26 Jun. 1974 17 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauch.-Issled. Tsentr. SSSR (USSR), no. 103, 1972 p 95-101
(FTD Proj. T74-01-19)
(AD-782053; FTD-HT-23-1161-74) Avail: NTIS CSCL 04/2

Results were formulated which pertain to mathematical aspects of the use of spectral methods for analyzing meteorological fields, particularly the question concerning the consequences of the necessity of special Fourier expansion with respect to longitude. Author

N74-34139# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PRELIMINARY RESULTS OF THE COMPARISON OF THE AMOUNT OF ARTIFICIAL PRECIPITATION AND WATER RESERVES OF SEEDED FRONTAL CLOUDS
B. N. Leskov 26 Jun. 1974 12 p refs Transl. into ENGLISH from Tr. Ukr. Nauch.-Issled. Gidrometeorol. Inst. (USSR), no. 106, 1971 p 37-41
(FTD Proj. T74-01-19)
(AD-782066; FTD-HT-23-1177-74) Avail: NTIS CSCL 04/2

The comparison of precipitation with the water reserves of clouds which have been seeded was investigated to determine the increase in precipitation due to the modification. It is concluded that frontal clouds can not be considered reservoirs of additional moisture, and that seeding has value for modification of clouds not producing natural precipitation. F.O.S.

N74-34140# Hydrocomp, Inc., Palo Alto, Calif.
PREDICTION OF DEW POINT TEMPERATURE, SOLAR RADIATION AND WIND MOVEMENT DATA FOR SIMULATION AND OPERATIONS RESEARCH MODELS
Delbert D. Franz Apr. 1974 57 p refs
(Contract DI-14-31-0001-3736)
(PB-232987/8) Avail: NTIS HC $3.75 CSCL 04B

Predictive relationships for mean daily dew point temperature, daily total shortwave solar radiation, and daily wind movement using daily maximum and minimum air temperature as the predictor variable were derived for approximately 23 stations in the United States. A simple linear regression of dew point on minimum temperature proved to be best for dew point prediction. The fit was best in the humid regions in the winter and poorest in the summer in the arid and semi-arid regions. Percent of possible solar radiation was regressed on the daily range in temperature for the solar radiation relationship. The fit obtained was poorer than the fit for dew point. The coefficient of correlation for the dew point relationships was most frequently in the range of 0.7 to 0.95 while for solar radiation the range was generally for 0.5 to 0.8. The standard error of estimate for dew point ranged from 2.0 to 10.0 degrees Fahrenheit with most values in a narrower range from 4.0 to 6.0 degrees. The standard error for solar radiation was most frequently in the range of 10 to 25%. GRA

N74-34141# Army Edgewood Arsenal, Md.
AIR POLLUTION FIELD STUDIES WITH A RAMAN LIDAR Technical Report, Jan. 1972 - Dec. 1973
Harry P. DeLong Jun. 1974 17 p refs
(DA Proj. 1B6-22401-AD-27)
(AD-781974; ED-TR-74006) Avail: NTIS CSCL 07/4

Raman lidar techniques have been discussed theoretically and sensitivities for various pollutants have been predicted. The results of the present real Raman Lidar indicates pollutant levels between 40-300 ppm are the present sensitivities but very realistic projections based on these data suggest sensitivities between 0.53-7 ppm could be reached if nondispersive detection techniques were used. Author (GRA)

N74-34142# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PROBLEM OF STATISTICALLY MODELING TWO-DIMENSIONAL METEOROLOGICAL FIELDS
R. L. Kagan and E. I. Fedorchenko 26 Jun. 1974 13 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 308, 1973 p 20-26
(FTD Proj. T74-01-1921)
(AD-782051; FTD-HC-23-2162-74) Avail: NTIS CSCL 04/2
In a previous article, the problem of modeling random sequences with assigned statistical characteristics was examined. During this process, the sequence was conceived as the realization of a unidimensional random process at fixed points (or at discrete moments in time). In addition to this, modeling two-dimensional fields is of interest for solving many problems. An examination of certain questions relative to modeling such fields is also the subject of this article. GRA

N74-34143# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OPERATIONAL CALCULATIONS OF SHORT-RANGE FORECASTS BY COMPLETE EQUATIONS FOR THE TERRITORY OF THE NORTHERN HEMISPHERE
D. Ya. Pressman 26 Jun. 1974 16 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauch.-Issled. Tsentr. SSSR (USSR), no. 99, 1972 p 3-11
(FTD Proj. T74-01-19)
(AD-782063; FTD-MT-24-1110-74) Avail: NTIS CSCL 04/2
The idea expressed by I. A. Kibel of transition from forecasting by quasi-geostrophic schemes to weather forecasting by complete equations of hydrodynamics has found wide practical application at present. The finite-difference scheme, which is the topic of discussion here, is one of the schemes, created for the solution of the problem of short-range forecasting by complete equations. GRA

N74-34144# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONDENSATION STAGE OF DEVELOPMENT OF CLOUD SPECTRUM AND SEMI-ANALYTICAL METHOD OF STUDYING IT
K. I. Vasileva and Yu. S. Sedunov 17 Jun. 1974 26 p refs Transl. into ENGLISH from Tr. Fiz. Aerodispersnykh Sistem (USSR), no. 23, 1971 p 108-124
(AD-782069; FTD-HT-23-892-74) Avail: NTIS CSCL 04/2
The main properties of the cloud formation were studied along with the effects of the drop concentration, vertical rising rate of the air mass, and the coefficient of turbulent diffusion. Beginning with a simple kinetic equation, the solution that satisfies the initial boundary condition for condensation is derived. It is concluded that an increase in the coefficient of turbulent diffusion leads to a rapid expansion of the cloud formation. F.O.S.

N74-34145# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NUMERICAL EXPERIMENTS EVALUATING THE ROLE OF HORIZONTAL AND VERTICAL RESOLUTION IN THE SPECTRAL FORECASTING MODEL
I. G. Veil and T. Ya. Ginsburg 26 Jun. 1974 16 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchno- Issled. Tsentr. SSSR (USSR), no. 100, 1972 p 35-45
(AD-782071; FTD-HC-23-2097-74) Avail: NTIS CSCL 04/2
Experiments estimating the role of vertical and horizontal resolution were carried out on the basis of difference and spectral models of the atmosphere. It is convenient to study the dependence between the results of calculations and space resolution, because in such models dividing up the space simplifies an interpretation. An attempt to investigate particular aspects of such a dependence is presented. GRA

N74-34146# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NUMERICAL FORECAST FOR 3-5 DAYS USING COMPLETE EQUATIONS OF HYDRODYNAMICS AND QUESTIONS OF THE MATCHING OF INITIAL FIELDS OF METEOROLOGICAL ELEMENTS
S. O. Krichak, N. G. Fedorov, and M. S. Fuks-Rabinovich 18 Jun. 1974 22 p refs Transl. into ENGLISH from Tr. v Vses. Meteorol. Sezda. Sektsiya Prognoza Pogody (USSR), v. 2, 1972 p 55-67
(AD-782533; FTD-MT-24-1109-74) Avail: NTIS CSCL 04/2
In the U.S.S.R. translation, a baroclinic model of the atmosphere based on the use of complete thermohydrodynamics equations is examined. The model describes forecast changes in the fields of the geopotential, wind velocity, temperature, humidity, and surface pressure. GRA

N74-34147# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PRESENT STATE AND IMMEDIATE PROBLEMS OF SHORT-TERM HYDRODYNAMIC WEATHER FORECASTING
V. V. Bykov, S. A. Bortnikov, V. M. Kadyshnikov, and D. Ya. Pressman 24 Jun. 1974 19 p refs Transl. into ENGLISH from Tr. v Vses. Meteorol. Sezda. Sektsiya Prognoza Pogody (USSR), v. 2, 1972 p 8-18
(FTD Proj. T74-01-19)
(AD-782547; FTD-HT-23-114-74) Avail: NTIS CSCL 04/2
Further advancements in the theory and practice of hydrodynamic short-term weather forecasting is illustrated by a brief description of prognostic models and effective work being done in the Hydrometeorological Scientific Research Center, U.S.S.R. with the aid of the complete hydrodynamics equations. GRA

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N74-34148# Mitre Corp., McLean, Va.
STUDY OF ALTERNATIVE BEACON BASED SURVEILLANCE AND DATA LINK SYSTEMS. VOLUME 1: SUMMARY Final Report
S. R. Jones, R. C. Gibbons, A. M. Manders, N. A. Spencer, and I. B. Ylvisaker Mar. 1974 45 p refs
(Contract DOT-FA70WA-2448)
(AD-776676; MTR-6517-Vol-1; FAA-EM-74-7-Vol-1) Avail: NTIS HC $3.25
Several beacon-based surveillance systems--both addressed and non-addressed--as well as several data link systems, in appropriate combinations, were analyzed with respect to meeting the future requirements of the Upgraded Third Generation ATC System. These requirements included surveillance characteristics suitable for automatic ground-based collision avoidance (IPC); they also included data link characteristics suitable for delivering all ATC and IPC services and estimated company digital communication services. The Discrete Address Beacon System (DABS) is shown to be the lowest cost of all alternatives for implementing IPC for the basic general aviation user. Author

N74-34149# Mitre Corp., McLean, Va.
A DESCRIPTION OF THE INTERMITTENT POSITIVE CONTROL CONCEPT
A. L. McFarland and B. M. Horowitz 11 Feb. 1974 75 p
(Contract DOT-FA70WA-2448)
(AD-776111; MTR-6587; FAA-EM-74-1) Avail: NTIS HC $3.75
The Intermittent Positive Control system of air traffic control procedures is discussed. The system is a totally automatic ground-based collision avoidance capability which issues collision avoidance commands to aircraft as required. In addition it provides pilots with information on the location of nearby aircraft, provides increased safety in mixed and uncontrolled airspace for both IFR and VFR aircraft, and maintains the freedom of action associated with VFR flight. The development and operation of the system are explained. Author

N74-34150*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
INTERPLANETARY NAVIGATION USING PULSATING RADIO SOURCES
G. S. Downs 1 Oct. 1974 18 p refs
(Contract NAS7-100)
(NASA-CR-140398; JPL-TR-32-1594) Avail: NTIS HC $4.00

CSCL 17G

Radio beacons with distinguishing signatures exist in nature as pulsating radio sources (pulsars). These objects radiate well determined pulse trains over hundreds of megahertz of bandwidth at radio frequencies. Since they are at known positions, they can also be used as navigation beacons in interplanetary space. Pulsar signals are weak and dispersive when viewed from earth. If an omnidirectional antenna is connected to a wideband receiver (200 MHz bandwidth centered at 200 MHz) in which dispersion effects are removed, nominal spacecraft position errors of 1500 km can be obtained after 24 h of signal integration. An antenna gain of 10 db would produce errors as low as 150 km. Since the spacecraft position is determined from the measurement of the phase of a periodic signal, ambiguities occur in the position measurement. Simultaneous use of current spacecraft navigation schemes eliminates these ambiguities. Author

N74-34151# Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.

INVESTIGATION OF PARASITIC LOOP COUNTERPOISE ANTENNAS AND THEIR APPLICATION TO VOR SYSTEMS Final Report, Aug. 1969 - Oct. 1972

Dipak L. Sengupta and Joseph E. Ferris Jan. 1974 194 p refs

(Contract DOT-FA69WA-2085)

(AD-775374; FAA-RD-72-32) Avail: NTIS HC $5.00

The radiation fields produced by conventional VOR and parasitic loop counterpoise antennas have been investigated both theoretically and experimentally. Theoretical expressions for the side band mode radiation fields produced by conventional VOR antennas have been obtained by applying the concepts of geometrical theory of diffraction. Using similar techniques expressions have been obtained for both carrier and side band mode radiation fields produced by single parastic loop counterpoise antennas. It has been found that for large separation distance between the parasitic loops, the mutual coupling effects may be neglected during the evaluation of double parasitic loop counterpoise antennas. All the above theoretical results have been compared with the experimental results obtained from model measurements. Within the ranges of approximations made in the theoretical analysis and the experimental errors, the agreement between theory and experiment has been found to be satisfactory. Author

N74-34152# Atlantic Research Corp., Alexandria, Va.

SPECTRUM CHARACTERISTICS ANALYSIS AND MEASUREMENT (SCAM) EQUIPMENT STUDY Final Report

James J. Crenca, Wade R. Cothran, and Billy D. Pritchard Apr. 1973 142 p refs

(Contract DOT-FA72WA-2997)

(AD-774652; FAA-RD-72-131) Avail: NTIS HC $5.00

An evaluation of FAA spectrum characteristics analysis and measurement capabilities and requirements is presented. This evaluation covers existing and future FAA equipment which have an impact on the measurement instruments required. Recommendations for measurement techniques and new measurement instrumentation are included along with outline drawings showing these instruments configured in a mobile facility. Determination of the feasibility of developing miniaturized SCAM equipment was accomplished, and suggested configurations are presented. Author

N74-34153*# Massachusetts Inst. of Tech., Cambridge. Flight Transportation Lab.

A COMPARATIVE ANALYSIS OF AREA NAVIGATION SYSTEMS IN GENERAL AVIATION M.S. Thesis

Stephen Malcolm Dodge Jun. 1973 190 p refs

(Grant NGL-22-009-640)

(NASA-CR-132504; FTL-R74-1) Avail: NTIS HC $5.50 CSCL 17G

Radio navigation systems which offer the capabilities of area navigation to general aviation operators are discussed. The systems considered are: (1) the VORTAC system, (2) the Loran-C system, and (3) the Differential Omega system. The inital analyses are directed toward a comparison of the systems with respect to their compliance to specified performance parameters and to the cost effectiveness of each system in relation to those specifications. Further analyses lead to the development of system cost sensitivity charts, and the employment of these charts allows conclusions to be drawn relative to the cost-effectiveness of the candidate navigation system. Author

N74-34154*# Scientific Translation Service, Santa Barbara, Calif.

FLIGHT OPERATIONS AND GUIDE BEAM SYSTEMS

T. Bohr Washington NASA Oct. 1974 24 p Transl. into ENGLISH from the German report DGLR-73-011 Presented at the DGLR DGON Symp. on Neue Anflug- und Landeverfahren, Duesseldorf, 2-4 May 1973

(Contract NASw-2483)

(NASA-TT-F-15962; DGLR-73-011) Avail: NTIS HC $4.25 CSCL 17G

The history and perspectives of the instrument landing system are presented. The present operational requirements for these systems, as endorsed by the ICAO, are formulated and discussed. The configuration of the ILS is discussed to show the components involved. Examples of the instrument landing systems are illustrated. Author

N74-34155# McDonnell-Douglas Corp., St. Charles, Mo.

SYNCHRONIZATION STATION LOCATION STUDY. TRADE-OFF PHASE Final Report, Nov. 1973 - May 1974

J. M. Holt and F. D. Watson May 1974 79 p refs

(Contract DOT-FA73WA-3172)

(AD-785335; FAA-RD-74-117) Avail: NTIS HC $3.75

Techniques were developed and applied in making trade-off evaluations of the overall synchronization effectiveness of various levels of airborne vs. ground-based hierarchal time relaying equippage. It is shown that the number of ground-based master stations required to supply a desired level of synchronization coverage to all aircraft (hierarchal and non-hierarchal), increases as rapidly as the number of hierarchal aircraft is diminished. Trade-off studies were made of the master station site selection algorithms. It is shown that the priority algorithm is very near optimum. Choices of alternate sets of sites (such as air traffic hubs) can be used to obtain operational economic advantages with only slight reduction in overall effectiveness. Analytic and computational processes were extended to evaluate the effects of master station outages, and reduction in hierarchal support due to airline outrage and weather. Hierarchal interconnection provided a high degree of redundancy, and the overall system exhibited little loss in effectiveness under these abnormal conditions. Author

N74-34156# National Aviation Facilities Experimental Center, Atlantic City, N.J.

ADVANCED FLIGHT CONTROL AND ELECTRONIC DISPLAY SYSTEMS FOR ALL-WEATHER FLIGHT OPERATIONS: A LITERATURE REVIEW AND BIBLIOGRAPHY Final Report, Jan. 1968 - Oct. 1973

Jack J. Shrager Jun. 1974 143 p refs

(AD-783987; FAA-EM-74-12; FAA-NA-73-78) Avail: NTIS HC $4.75

A review of all literature published since 1967 relating to aircraft flight controls and displays was made. Special emphasis was placed on the contents of those documents as they related to the all-weather landing and takeoff operational envelope. The results of this review are evaluated, summarized, and conclusions drawn. This is supplemented by an annotated bibliography and author's index. Author

N74-34157# Ohio Univ., Athens. Avionics Engineering Center.

INVESTIGATIONS TO PROVIDE IMPROVED GLIDE SLOPE OPERATION DURING PERIODS OF GROUND-PLANE SNOW COVER. VOLUME 2: DETAILS OF 1972-1973 INVESTIGATIONS Final Report, 1972 - 1973

J. J. Battistelli and R. H. McFarland Apr. 1974 60 p refs

(Contract DOT-FA69WA-2066-MOD 17)

(AD-783631; FAA-RD-74-69-Vol-2; EER5-18-Vol-2) Avail: NTIS HC $3.75

The effects of ground-plane snow covers on image glide slopes are presented. This investigation involved extensive instrumentation for gathering continuous, detailed information on glide slope performance in both the near and far-fields. Experimental results were consistent with theory previously developed and provide a basis for some useful conclusions and recommendations.

Effects of snow depth less than ten inches are not significant in terms of far-field performance. However, conventional near-field monitors may produce out-of-tolerance indications. Integral monitoring is found to provide excellent service and may be regarded as highly reliable and representative for depths up to at least 10 inches. For greater depths no conclusive, consistent data is yet available. Author

N74-34158# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
OMEGA: FACTS, HOPES, AND DREAMS Final Report
J. A. Pierce Jun. 1974 156 p refs
(Contract N00014-67-A-0298-0008; NR Proj. 371-013)
(AD-782396; TR-652) Avail: NTIS CSCL 17/7

This paper summarizes a number of ideas that may help to improve the accuracy and reliability of the Omega radio aid to navigation. The study begins with an introduction to the use of coherent signals at various frequencies, and proceeds, using this nomenclature, to show ways in which errors of prediction and propagation can be reduced. It continues with suggestions of how a greater amount of coherent information can be added to the Omega signal format to permit world-wide lane identification, which is needed for improving the efficiency of search and rescue operations, and for other purposes. The conclusion is a study of practical computations for determining latitude and longitude when several time differences are known but when there is no prior knowledge about position. The intent is to provide suggestions for modest improvements in accuracy and a major increase in the reliability and utility of this position-finding system.
Author (GRA)

N74-34159# Naval Electronics Lab. Center, San Diego, Calif.
DOPPLER MICROWAVE LANDING SYSTEM ELECTRONIC PITCH STABILIZATION
R. J. Wager 3 Jun. 1974 37 p
(WF21211001; XF21232017)
(AD-782352; NELC-TD-323) Avail: NTIS CSCL 17/7

As part of the Navy R and D effort in support of the FAA National Microwave Landing System Development, NELC has studied the electronic pitch stabilization method proposed by ITT Gilfillan and determined the stabilization errors resulting from it. The method is shown to have significant errors. It cannot uniformly correct for the errors caused by ship motion over the entire system coverage volume. Residual error after pitch compensation- a function of aircraft position, elevation antenna offset, and selected pitch compensation angle-causes the aircraft to approach the carrier via an undulating path. Residual errors can be reduced by changing the Gilfillan pitch angle, but they remain significant. Author (GRA)

N74-34160# Transportation Systems Center, Cambridge, Mass.
IMPACT OF SATELLITE AERONAUTICAL CHANNEL ON MODEM SPECIFICATIONS Final Report, Aug. 1972 - Mar. 1973
Phillip A. Bello, Charles J. Boardman, David Chase, and Joseph K. DeRosa Mar. 1974 298 p refs Prepared by CNR, Inc.
(Contract DOT-TSC-516-1)
(AD-778390/5; TSC-FAA-74-1; FAA-RD-74-54) Avail: NTIS HC $6.75

The report analyzes the effects of surface-scattered multipath on the performance of ranging and data modems such as might be used on the aircraft-satellite channel of an air-traffic control system. An exact analysis is carried out on the effects of noise and multipath on the one-way ranging errors of a single-sideband tone ranging modem. These results are shown to be applicable at high SNR and direct path/multipath ratios to a double-sideband tone ranging modem whose side-band separation equals the tone separation in the single sideband system. The conventional practice of calculating ambiguity error probabilities with an assumption of Gaussian ranging error distribution is shown to be inapplicable for many situations of practical interest. (Modified author abstract) GRA

N74-34161# Princeton Univ., N.J. Dept. of Civil and Geological Engineering.
MODELING AIR TRAFFIC PERFORMANCE MEASURES. VOLUME 1: MESSAGE ELEMENT ANALYSES AND DICTIONARIES Interim Report, Jul. 1972 - Aug. 1973
J. S. Hunter, D. E. Blumenfeld, and D.-A. Hsu Jul. 1974 334 p refs
(Contract DOT-FA72NA-741)
(AD-782437; FAA-RD-73-147-1) Avail: NTIS CSCL 17G

The report contains analyses of voice communications between aircraft and controller, with the objective of describing the overall patterns of these transactions. In particular, the distributions of message element frequencies and transmission times are examined. Comparisons between ground-initiated and pilot-initiated transmissions show little differences in the distributions. However, there are considerable differences when the data are broken down into messages made during first, last and other communication transactions. Distributions of operational characteristics (i.e. request, acknowledgment, etc.) also differ between ground- and pilot-initiated transmissions. Detailed dictionaries of the different message combinations appearing as transmissions are given in the second part of the report.
Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N74-34162# Bhabha Atomic Research Centre, Bombay (India).
SPECTROSCOPY DIVISION Annual Progress Report, 1972 - 1973
V. B. Kartha, ed. and N. A. Narasimham, ed. 1973 75 p refs
(BARC-684) Avail: AEC Depository Libraries HC $5.75

Progress is reported in the following general areas of research: analysis of high purity and reactor grade materials; atomic, molecular, and solid state spectroscopy; optics; and service electronics. Work carried out during 1972-73 in each of these areas is reported. NSA

N74-34163# Sandia Labs., Albuquerque, N.Mex.
ELECTRON BEAM INDUCED FUSION
G. Yonas 1973 33 p refs Presented at Topical Conf. on Energy, Chicago, 4 Feb. 1974 Sponsored by AEC
(SLA-73-5967; Conf-740201-2) Avail: NTIS HC $3.75

The use of tightly focused relativistic electron beams for heating and compression of a plasma for controlled fusion is described. Recent progress as well as areas for further study, particularly oriented toward the creation of reactor concepts is outlined. NSA

N74-34164# Brookhaven National Lab., Upton, N.Y.
RADIOACTIVE RARE GASES AND TRITIUM IN THE SAMPLE RETURN CONTAINER, AND THE Ar-37 AND Ar-39 DEPTH PROFILE IN THE APOLLO 16 DRILL STEM
R. W. Stoenner, R. Davis, Jr., and M. Bauer 1973 33 p refs Sponsored by AEC
(BNL-18580) Avail: NTIS HC $3.75

Gas was extracted from the sample return container from the Apollo 16 and 17 missions by adsorption on charcoal and activated vanadium metal. The hydrogen, argon, and radon were separated and counted to give the tritium, Ar-37, Ar-39, and Rn-222 activities. The tritium and argon activities observed could be explained by diffusive losses of these gases from the fine material in the container. The tritium, Ar-37, Ar-39, and Rn-222 activities and the K, Ca, Ti, Fe, and Mn contents were measured on a set of samples from the Apollo 16 deep drill stem at depths from 83 to 343 g/sqcm. Since Ar-37 is produced mainly by the Ca-40(n,alpha)Ar-37 reaction it is possible to determine the neutron production rate in the regolith as a function of the depth. The Rn-222 extracted from the samples by vacuum melting was found to be lower than expected in some samples based upon their uranium contents. The hydrogen and helium contents of the drill stem samples were measured and found to be relatively uniform with depth in contrast to similar measurements on Apollo 15 and 17 drill stems. Author (NSA)

N74-34165# Pratt and Whitney Aircraft, Middletown, Conn. Advanced Nuclear Engineering Lab.
NUCLEAR PROPULSION PROGRAM Engineering Progress Report, 1 Jul. - 15 Oct. 1957
1957 121 p
(Contract AT(11-1)-229)
(PWAC-573; PR-25) Avail: NTIS HC $8.25

Information on the development of sodium and lithium cooled nuclear reactors for turbojet engines is presented concerning powerplant performance and operation, propulsion machinery development, reactor engineering, reactor physics, controls and instrumentation, and materials fabrication and metallurgy. NSA

N74-34166# Pratt and Whitney Aircraft, East Hartford, Conn.
NUCLEAR PROPULSION PROGRAM Engineering Progress Report, 1 Oct. - 31 Dec. 1955
1955 108 p
(Contract AT(11-1)-229)
(PWAC-554; PR-18) Avail: NTIS HC $7.50

Information on the development of a nuclear powered turbojet engine is presented. Data cover powerplant performance, propulsion machinery heat exchangers, pump systems, piping systems, reactor engineering and physics, dynamics and control, and materials development. NSA

N74-34167# Atomic Energy Commission, Washington, D.C.
SCIENTIFIC REPORTS: SITING OF NUCLEAR TECHNICAL INSTALLATIONS TO PREVENT EXTERNAL INFLUENCES
K. Drittler, P. Gruner, and L. Suetterlin Dec. 1973 24 p refs Transl. into ENGLISH of "Wissenschaftliche Berichte. Zur Auslegung kerntechnischer Anlagen gegen Einwirkungen von Aussen. Teilaspekt: Flugzeugabsturz - Zwischenbericht", Rept. IRS-W-7 Inst. fuer Reaktorsicherheit der TUV e.V., Koeln, F. R. Germany, Dec. 1973
(AEC-TR-7539; IRS-W-7) Avail: NTIS HC $4.25

Load assumptions are presented which form the basis for designing nuclear power plants against the consequences, which might arise from aircraft impact on reactor buildings. The local effects of impact and the effects on the construction as a whole are examined. Penetration formulas are offered which allow for the calculation of the minimum thickness of the protective walls. A load-time-function for the impact of aircraft on rigid walls is presented. Author (NSA)

N74-34168# Oak Ridge National Lab., Tenn.
MATERIALS INFORMATION IN THE RADIATION SHIELDING INFORMATION CENTER
B. F. Maskewitz, D. K. Trubey, and R. W. Roussin Apr. 1974 10 p refs Presented at Materials Information Programs Meeting, Gaithersburg, Md., 16 Apr. 1974 Sponsored by AEC
(Conf-740424-2) Avail: NTIS HC $4.00

The Radiation Shielding Information Center (RSIC), serves the shielding community by collecting, organizing, processing, evaluating, packaging, and disseminating information mainly related to reactor and weapons radiation. The scope includes the physics of interaction of radiation with matter, radiation production, transport and energy deposition, radiation detectors and measurements, engineering design techniques, shielding materials properties, computer codes useful in research and design, and shielding data compilations. This information is analyzed, evaluated, synthesized, and repackaged in a form more authoritative, timely, and useful. Promoting exchange and improvement of nuclear data, computer codes, and radiation transport information, RSIC provides strong support for the technology areas of its sponsors. Author (NSA)

N74-34169# Atomic Energy Commission, Washington, D.C.
SURVEY OF UNIQUE TECHNICAL FEATURES OF THE FLOATING NUCLEAR POWER PLANT CONCEPT
Mar. 1974 112 p refs
(WASH-1304) Avail: NTIS HC $5.45

The manufacture, installation, operation, and decommissioning of floating nuclear power plants at offshore sites are examined with respect to the major technical differences between such plants and land-based nuclear power plants. Anticipated environmental effects of activities associated with offshore nuclear plants are discussed. Possible accidents both inplant and during the transport of radioactive materials to and from an offshore plant are described and an initial estimate of their relative significance presented. Author (NSA)

N74-34170# California Univ., Livermore. Lawrence Livermore Lab.
REVIEW OF SOVIET DATA ON THE PEACEFUL USES OF NUCLEAR EXPLOSIONS
M. D. Nordyke 1 Apr. 1974 49 p refs Revised
(Contract W-7405-eng-48)
(UCRL-51414-Rev-1) Avail: NTIS HC $4.00

The results of 14 experimental and industrial explosions designed to develop nine different applications in the petroleum, gas, and minerals industries are described as well as water resources development. The large number of large unidentified seismic events that have been reported over the last seven years in areas of the Soviet Union outside the normal nuclear-weapon test areas are considered. The PNE program that the Soviets have publicly discussed in various reports and at various meetings is summmarized and, when appropriate, compared to data from the U.S. Plowshare Program. Author (NSA)

N74-34171# Battelle-Northwest, Richland, Wash.
NUCLEAR RADIATION: SOURCES AND IMPACT
C. M. Unruh Apr. 1974 29 p refs Presented at Waste Management Symp., Tucson, Ariz., 21 Apr. 1974
(Contract AT(45-1)-1830)
(BNWL-SA-4962; Conf-740434-1) Avail: NTIS HC $4.50

Data on the sources of radiation exposure of human populations in the U.S.A. and the average annual dose resulting from each source are reviewed. The radiation dose from the nuclear power industry is at the bottom of the list in terms of quantity of dose and consequently in terms of impact on man. Nevertheless, waste management programs throughout the nuclear power industry are designed to keep radiation impact on man at the level as low as practicable regardless of the inconsequential impact. It is estimated that in the year 2000 with 1,000 nuclear power plants in operation, the average annual dose from this industry will be less than 0.4% of the unavoidable natural background radiation levels. NSA

N74-34172# California Univ., Livermore. Lawrence Livermore Lab.
TRITIUM IN NUCLEAR FUSION POWER
R. G. Hickman 13 Mar. 1974 13 p refs Presented at the 77th Natl. Meeting of the Am. Inst. of Chem. Engr., Pittsburgh, 13 Mar. 1974 Sponsored by AEC
(UCRL-75546; Conf-740609-1) Avail: NTIS HC $4.00

A brief introduction is given to the role tritium will play in the development of fusion power. The biological and world-wide environmental behavior of tritium is reviewed. The tritium problems encountered in fission power reactors are discussed, and the problems expected in fusion power reactors are outlined. Author (NSA)

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N74-34173*# National Aeronautics and Space Administration, Washington, D.C.
PHYSICAL SCIENCES: THERMODYNAMICS, CRYOGENICS, AND VACUUM TECHNOLOGY: A COMPILATION Technology Utilization
[1974] 26 p refs
(NASA-SP-5973(01)) Avail: NTIS HC $1.00 CSCL 20M

Technological developments which have potential application outside the aerospace community are reported. A variety of thermodynamic devices including heat pipes and cooling systems are described along with methods of handling cryogenic fluids. Vacuum devices are also described. F.O.S.

N74-34174*# Alabama A & M Univ., Normal. Dept. of Physics and Mathematics.
ANALYTICAL STUDIES OF ULTRASHORT OPTICAL PULSE PROPAGATION IN A RESONANT ABSORBING MEDIUM Final Report, Sep. 1972 - Aug. 1974
Ching Tsung Lee Aug. 1974 7 p refs
(Grant NGR-01-001-020)
(NASA-CR-140119) Avail: NTIS HC $4.00 CSCL 20F

Resonant absorption in a laser pulse can be reduced to zero if the trailing part induces stimulated emission and returns the absorbed energy back to the pulse. This kind of effect is called Self-Induced Transparency (SIT). Analytic descriptions of short pulse propagation in a resonant medium, based on Slowly Varying Envelope Approximation (SVEA) and in linear media, have been extended in studies of SIT along two principal directions: First, to improve the SVEA by introducing Short Pulse Approximation (SPA); and second, to consider the effect of nonlinear refractive index. Author

N74-34175# Joint Publications Research Service, Arlington, Va.
SCATTERING OF ACOUSTICAL SIGNALS FROM SEA SURFACE
13 Sep. 1974 39 p refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 20, nos. 2 and 3, 1974 39 p
(JPRS-62958) Avail: NTIS HC $5.00

Experimental studies are presented of phase characteristics of backscattered hydroacoustic signals. For individual titles, see N74-34176 through N74-34178.

N74-34176 Joint Publications Research Service, Arlington, Va.
STUDY OF THE PHASE CHARACTERISTICS OF ACOUSTIC SIGNALS SCATTERED BY A WAVY WATER SURFACE
V. I. Zeldis, I. A. Leykin, A. D. Rozenberg, and V. G. Ruskevich *In its* Scattering of Acoust. Signals from Sea Surface (JPRS-62958) 13 Sep. 1974 p 1-11 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 20, no. 2, 1974 p 235-241 (For availability see N74-34175 23-23)

Results are presented from an experimental study of the phase characteristics of a backscattered hydroacoustic signal in the frequency range from 15 to 60 kilohertz and glancing angles from 10 degrees to 50 degrees. The experiments were performed in a tank and, partially, in the sea. The acoustic measurements are accompanied by measurements of the two-dimensional spectra of the scattering surface. The results obtained are well explained within the framework of resonance scattering theory. Author

N74-34177 Joint Publications Research Service, Arlington, Va.
STUDY OF THE FLUCTUATION CHARACTERISTICS OF ACOUSTIC SIGNALS SCATTERED BY A WAVY WATER SURFACE
V. I. Zeldis, A. D. Rozenberg, and V. G. Ruskevich *In its* Scattering of Acoust. Signals from Sea Surface (JPRS-62958) 13 Sep. 1974 p 12-21 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 20, no. 3, 1974 p 402-408 (For availability see N74-34175 23-23)

The results are presented from an experimental study in a tank and in the sea of the amplitude and phase fluctuations of a backscattered hydroacoustic signal in the frequency range from 15 to 60 kilohertz for glancing angles from 10 to 50 degrees. The acoustic measurements are accompanied by measurements of the two-dimensional spectra of the scattering surface. The results obtained are well explained within the framework of scattering theory on a two-scale surface. Author

N74-34178 Joint Publications Research Service, Arlington, Va.
SPECTRAL WIDTH OF SIGNALS SCATTERED ON A WAVY SEA SURFACE
I. M. Fuks *In its* Scattering of Acoust. Signals from Sea Surface (JPRS-62958) 13 Sep. 1974 p 22-36 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 20, no. 3, 1974 p 458-468 (For availability see N74-34175 23-23)

A discussion is presented of the causes of the broadening of the spectrum of sound signals reflected from a wavy sea surface. Formulas are obtained for the spectrum in the second order of the perturbation theory, and the effect of the damping on the broadening of the signal spectrum scattered on fine ripples is estimated. The criteria of applicability of the 'two-scale' model of the scattering surface in the case of a developed sea wave action are presented. A study was made of the effect of the Doppler broadening caused by movement of the ripple with large-scale components of the wave action on the fluctuations of the instantaneous frequency and the energy spectrum of the scattered signal. Author

N74-34179# Lockheed Missiles and Space Co., Palo Alto, Calif.
THERMAL CONNECTIONS TO DIMINISH HEAT INFLUXES IN CRYOSTATS
N. A. Pankratov, V. S. Golubkov, and L. G. Simoshenkova [1974] 5 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (USSR), no. 6, 1974 p 1067-1071
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The influence of thermal connections on the helium evaporation rate in a nitrogen-free cryostat with several suspension tubes is investigated experimentally. The optimal quantity and location of the connections on the suspension tubes are determined. Author

N74-34180*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENTS ON THE ORIGINS OF OPTICAL ACTIVITY
William A. Bonner (Stanford Univ.) and Jose J. Flores 1973 17 p refs Presented at the 4th Intern. Congr. on the Origin of Life, Barcelona, Jun. 1973
(Grant NGL-05-020-582)
(NASA-TM-X-70330) Avail: NTIS CSCL 20F

The adsorption of L-phenylalanine from 10/3 m aqueous solution by kaolin was compared to that of D-phenylalanine at pH 6, and the speed of L-aspartic acid polemerization by kaolin was compared to that of D-aspartic acid in 10/2 m solution at 90 deg. Spectropolarimeteric and chromatographic evaluations of supernatant solution discovered little optical activity, no preferential adsorption of either phenylalanine enantiomer, no resolution of the recemic phenylalanine by kaolin, and also no selective polymerization of L-over D-aspartic acid by kaolin. G.G.

N74-34181# Oak Ridge Y-12 Plant, Tenn.
STUDY OF FACTORS AFFECTING CALIBRATIONS AND CALCULATIONS FOR THE MONOCHROMATIC X-RAY ABSORPTION-EDGE ANALYTICAL METHOD
R. E. Barringer 17 May 1974 19 p refs
(Contract W-7405-eng-26)
(Y-1940) Avail: NTIS HC $4.00

A modified calculation equation gave results more closely following the known values of standard samples. Recommendations are given for improving the choice of standards and calibration procedure for the monochromatic X-ray absorption method. Author (NSA)

N74-34182# Commissariat a l'Energie Atomique, Grenoble (France).
MEASUREMENT OF FARADAY EFFECT IN HIGH TRANSIENT MAGNETIC FIELDS: 4 MEGAOERSTEDS
M. Guillot, J. C. Lenoir, and R. Signoret 1973 7 p refs In FRENCH Presented at the Intern. Conf. on Magnetism, Moscow, 22 Aug. 1973
(CEA-Conf-2497; Conf-730821-5) Avail: AEC Depository Libraries HC $4.00

Reproducible transient magnetic fields up to 4 megaoersteds (400 teslas) can be achieved when increasing the flux density trapped in a metallic cylinder; by chemical explosive the tube is accelerated and the seed field multiplied by 60. The design and construction of an apparatus for the measurement of the magneto-optic Faraday rotation in magnetic ordered samples, rare earth garnets are described. In YIG, at 0,6328 micron, the Faraday rotation presents a strong variation between 1,4 et 2,2 MOe. Author

N74-34183# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A PROGRAMMED AID FOR ANALYSIS OF THREE ELEMENT OPTICAL SYSTEMS Final Report
Daniel M. Litynski Apr. 1974 63 p refs
(DA Proj. 1T6-62609-A-308)

(AD-781495; BRL-MR-2372) Avail: NTIS CSCL 20/6

A computer program has been written that outputs one of several sets of optical system parameters, while iterating one of the input parameters. The code can handle a system of one to three optical elements; these can be refracting or reflecting surfaces, or thin lenses. Output is available in tabular numerical form, as a graph, or both. Current subroutines provide: the system AFCD matrix and cardinal points; the location and magnification of the final image of the system; the separation of the elements needed to obtain a specific magnification and position of the final image; the powers of two of the elements required to obtain a specific magnification and position; and the power and position, of one of the elements, needed to obtain a specific magnification and position. Author (GRA)

N74-34184# Dayton Univ., Ohio.
PREPARATION OF dc ELECTROLUMINESCENT ZnS PHOSPHORS Interim Technical Report, Feb. - Oct. 1973
P. A. Palmer, D. C. Reynolds, and H. J. Stocker Apr. 1974 15 p refs
(Contract F33615-72-C-2144; AF Proj. 7885)
(AD-781194; ARL-74-0027) Avail: NTIS CSCL 20/6

The preparation of ZnS:Mn dc electroluminescent powders is described, the major process variables are identified and their empirical optimum values are described. The best phosphors produced have a brightness of 90 footlamberts at a bias voltage of 200 volts. Author (GRA)

N74-34185# Calspan Corp., Buffalo, N.Y.
THEORETICAL STUDIES ON FAN NOISE GENERATION BY A TRANSONIC COMPRESSOR BLADE ROW Final Report, 1 Jul. 1969 - 3 Dec. 1973
J. A. Lordi and G. F. Homicz Jun. 1974 53 p refs
(Contract F44620-69-C-0130; AF Proj. 6813)
(AD-782038; CALSPAN-AI-2836-A-3; AFOSR-74-0977TR) Avail: NTIS CSCL 20/1

A program of theoretical research on discrete-tone noise generation in transonic flows through fan and compressor blade rows is summarized. The sound field produced by an isolated rotor in an infinitely long annular duct with a uniform through-flow was considered. Linearized, three-dimensional analyses for the flow through lifting and nonlifting blade rows were used to relate the sound field to the blade thickness and loading distributions. Expressions were derived for the acoustic intensity within the duct and the sound pressure field outside the duct. Computational methods were then developed to evaluate the required reflection coefficients and directivity factors. (Modified author abstract) GRA

N74-34186# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
POLARIZED EMITTANCE. VOLUME 1: POLARIZED BIDIRECTIONAL REFLECTANCE WITH LAMBERTIAN OR NON-LAMBERTIAN DIFFUSE COMPONENTS Final Report, 10 Apr. - 31 Dec. 1972
J. R. Maxwell and S. F. Weiner May 1974 125 p refs
(Contract DAAD05-72-C-0246; F33615-70-C-1123; DA Proj. 1T0-61102-B-11A)
(AD-782178; ERIM-192500-1-T(1)-Vol-1; BRL-CR-154) Avail: NTIS CSCL 17/5

Volume I of this report provides the Ballistic Research Laboratories with a discussion of the algorithms upon which the bidirectional reflectance model is based, in particular the non-Lambertian volume model which was constructed under this contract. The report provides a validation of the model with respect to the materials supplied by BRL. It includes a listing of appropriate model parameters with a description of how to use the model, and a listing of the computer program with its subroutines. The model makes it possible to calculate bidirectional reflectance data from a very small amount of measured data. Accuracy demonstrated indicates that the model is very effective, although improvement can still be obtained at large receiver zenith angles. Author (GRA)

N74-34187# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
POLARIZED RADIANCE. VOLUME 3: WAVELENGTH DEPENDENCE OF POLARIZED BIDIRECTIONAL REFLECTANCE Final Report, 10 Apr. 1972 - 31 May 1973
J. R. Maxwell and S. F. Weiner May 1974 323 p refs
(Contract DAAD05-72-C-0246; DA Proj. 1T0-61102-B-11A)
(AD-782179; ERIM-19500-1-T(3)-Vol-3; BRL-CR-156) Avail: NTIS CSCL 17/5

Volume III of this report provides the Ballistic Research Laboratories with a method for extracting information from a limited set of directional and bidirectional reflectance measurements so as to provide a wavelength-corrected input to the volume component of the bidirectional reflectance model described in Volume I. It is shown that the surface component of the bidirectional reflectance has little wavelength dependence for the materials studied from 0.63 micrometer through 3.39 micrometers. Data resulting from extensive measurements performed at 0.63 micrometer, 1.06 micrometers, and 3.39 micrometers and 10.6 micrometers under this contract are included and are used for the model validation which is also described. Author (GRA)

N74-34188# Texas Instruments, Inc., Dallas. Electro-Optics Div.
MULTIPURPOSE INFRARED SYSTEMS (MIRS III) Final Report
28 Jun. 1974 277 p
(Contract F33615-73-C-1328)
(AD-782200; AFAL-TR-74-215) Avail: NTIS CSCL 17/5

The objective of this program was to advance the state-of-the-art technology for low cost; low weight; thermal imaging systems for remote piloted vehicles. The principle areas of study are in automatic focus compensation, structures, optic system designs and electronic multiplexing methods. The report covers preliminary designs for three types of FLIR systems and predicts quantity cost of production for quantities of 100 and 500. This report also includes design data that allows the application of technology to the reduction of piece part costs by using plastic parts. In this manner, temperature compensation of refractive optical systems, and compensated reflective optical systems, can be fabricated with improved performance and reduced weight. Valuable fall-out of this study includes; techniques that can be used in manned aircraft systems to improve performance, make them simpler to operate, and reduce system power and weight requirements. GRA

N74-34189# Naval Training Equipment Center, Orlando, Fla.
ABERRATIONS IN HOLOGRAPHIC LENSES
W. Neil Mohon Jun. 1974 29 p refs Presented at the meeting of the Fla. Sect. of the Opt. Soc. of Am., Winter Park, Fla., 11 May 1974
(NAVTRAEQUIPCEN Proj. 3713-02)
(AD-782509; NAVTRAEQUIPC-TN-40) Avail: NTIS CSCL 20/6

A derivation of first and third order holographic aberrations is presented. Wavefront error and ray tracing are discussed. A comparison of theoretical and experimental results is presented and discussed. Author (GRA)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N74-34190*# Boston Univ., Mass. Dept. of Chemistry.
EFFECTS OF ANISOTROPIC ELECTRON-ION INTERACTIONS IN ATOMIC PHOTOELECTRON ANGULAR DISTRIBUTIONS
Dan Dill, Anthony F. Starace (Nebr. Univ.), and Steven T. Manson (Ga. State Univ.) [1974] 38 p refs
(Grants NGR-28-004-021; NSF GP-38905)
(NASA-CR-140041) Avail: NTIS HC $5.00 CSCL 20H

The photoelectron asymmetry parameter beta in LS-coupling is obtained as an expansion into contributions from alternative angular momentum transfers j sub t. The physical significance of this expansion of beta is shown to be that: (1) the electric dipole interaction transfers to the atom a charcteristic single

angular momentum j sub t = sub o, where sub o is the photoelectron's initial orbital momentum; and (2) angular momentum transfers indicate the presence of anisotropic interaction of the outgoing photoelectron with the residual ion. For open shell atoms the photoelectron-ion interaction is generally anisotropic; photoelectron phase shifts and electric dipole matrix elements depend on both the multiplet term of the residual ion and the total orbital momentum of the ion-photoelectron final state channel. Consequently beta depends on the term levels of the residual ion and contains contributions from all allowed values of j sub t. Numerical calculations of the asymmetry parameters and partial cross sections for photoionization of atomic sulfur are presented. Author

N74-34191*# Scientific Translation Service, Santa Barbara, Calif.
MESON PRODUCTION AS A SHOCK WAVE PROBLEM
W. Heisenberg Washington NASA Sep. 1974 25 p refs Transl. into ENGLISH from Z. Phys. (West Germany), v. 133, 1952 p 65-79
(Contract NASw-2483)
(NASA-TT-F-15937) Avail: NTIS HC $4.25 CSCL 20H

The production of many mesons in the collision of two nucleons is described as a shock wave process represented by a nonlinear wave equation. The quantum-theoretical features of the process can then be considered a high quantum number process. Statements on the energetic and angular distributions of the various types of mesons arise from the solutions of the nonlinear wave equation. Author

N74-34192*# Old Dominion Univ. Research Foundation, Norfolk, Va.
COHERENT OPTICAL INSTRUMENTATION FOR MEASUREMENTS OF PARTICLE PARAMETERS Final Technical Report
William P. Chu Oct. 1974 18 p refs
(Grant NGR-47-003-088)
(NASA-CR-140446) Avail: NTIS HC $4.00 CSCL 20H

The application of cross-beam Laser Doppler Velocimeter (LDV) for sizing small particles was investigated from September 1973 to August 1974. Theoretical results were obtained by analyzing the scattering characteristics of small particles in a cross-beam LDV system. Theoretical calculations based on scalar diffraction theory and Mie scattering theory were performed. Experimental results were also obtained to compare with theoretical predictions. It is concluded that the forward scattering characteristics of small particles in a cross-beam LDV system can be used for particle sizing. Author

N74-34193# Electrotechnical Lab., Tokyo (Japan).
MEASUREMENTS OF BREMSSTRAHLUNG SPECTRA AND TOTAL PHOTON ABSORPTION CROSS SECTIONS FOR ELEMENTAL MATERIALS
Suguru Sugiyama Feb. 1974 60 p refs
(Rept-744) Avail: NTIS HC $6.00

A novel system for the energy spectrum measurements of bremsstrahlung beam from high energy electron accelerators has been established by the use of a new type of high efficiency magnetic pair spectrometer. The total photon absorption cross sections for water, magnesium, niobium and bismuth have been determined at photon energies from 6 MeV to 25 MeV with this measuring system. An improvement on a magnetic pair spectrometer has been carried out by the use of two current spark chambers as ladder counters in an ordinary type p air spectrometer. This attempt increases the detection efficiency of the spectrometer to 1,000 times as large as that of the ordinary type pair spectrometer. The detection efficiency of this spectrometer is estimated to be 3.5 counts/erg for the bremsstrahlung with the maximum energy of 25 MeV. Author

N74-34194# Sandia Labs., Albuquerque, N.Mex.
ESTIMATION OF PARTICLE SIZE DISTRIBUTIONS
J. A. Davis, S. M. Davenport, and F. Biggs Feb. 1974 25 p refs
(Contract AT(29-1)-789)
(SLA-73-576) Avail: NTIS HC $3.25

A means of estimating the distribution of particle sizes in certain regions of the atmosphere was investigated. A ray, to which the particles are opaque, was passed through the region and the cross sections of those intersected were measured. Under certain assumptions the distribution of cross-section diameters was written as an integral equation involving the underlying size distribution. The measurement data was used to estimate the distribution of cross sections and the integral equation then numerically unfolded to yield an estimate of the particle size distribution. The process was simulated for several distributions. Author (NSA)

N74-34195# Syracuse Univ., N.Y.
EXPERIMENTAL EVALUATION OF A SIMPLE MODEL FOR QUANTITATIVE ANALYSIS IN X-RAY PHOTOELECTRON SPECTROSCOPY
W. J. Carter, G. K. Schweitzer, and T. A. Carlson (ORNL) 1974 9 p refs Presented at the Intern. Conf. on Progr. in Res. and Appl. of Electron Spectry., Namur, Belgium, 16 Apr. 1974 Sponsored by AEC
(Conf-740429-1) Avail: NTIS HC $4.00

A simple model is described for calculating the relative intensities of photoelectron peaks for the different elements in a homogeneous solid sample. Using photoelectron cross sections of Scofield for Al and Mg Ka X-rays, we have determined the relative intensities of photoelectron peaks for various core subshells of all the elements from Z = 3 to 92. The calculated values are compared with experimental values for both gases and solids, and agreement is found to be satisfactory. Some of the special problems in quantitative analysis using X-ray photoelectron spectroscopy are discussed. In particular, it is shown how information regarding surface inhomogeneity may be obtained from comparison of intensities of photoelectron peaks. Author (NSA)

N74-34196# Uppsala Univ. (Sweden).
COMPARISON OF ALPHA-PARTICLES AND 16 O IONS AS BOMBARDMENT PARTICLES IN ION BACKSCATTERING ANALYSIS
S. Petersson, P. A. Tove, B. Sundqvist, and A. Johansson May 1973 22 p refs
(UPTEC-73-28-R) Avail: AEC Depository Libraries HC $4.25

For material analysis by ion backscattering spectrometry the quality of information depends on the type of ions used. Relevant quality factors are mass resolution, depth resolution, depth range of analysis and time of analysis. These factors are analyzed for two types of ions, alpha-particles and O-16 ions, considering optimum choice of the energy. For the chosen conditions the result is that O-16 ions give better mass and depth resolutions by factors approximately equal to 2.5 and approximately equal to 1.5 to 2, respectively. The depth of analysis for O-16 is about 2/3 of that for alphas. The analysis counting rate for O-16 ions is about half of that for alphas. Author (NSA)

N74-34197# Lund Univ. (Sweden). Dept. of Physics.
FAST HELIUM NUCLEI IN INTERACTIONS INDUCED BY VERY HEAVY NUCLEI
B. Jakobsson, R. Kullberg, and I. Otterlund Dec. 1973 31 p refs
(LUIP-CR-73-14) Avail: NTIS HC $4.75

Fast helium nuclei emitted in interactions between heavy cosmic ray nuclei and photoemulsion nuclei at energies greater than 1 GeV/nucleon were studied. Comparisons with interactions where the incident particles are protons, pions or light nuclei reveal some characteristic features of nucleus-nucleus interactions. The frequency of fast target helium nuclei is much larger and the high energy tail of the energy spectrum of these helium nuclei is more pronounced in nucleus-nucleus interactions than in proton-nucleus and pion-nucleus interactions. The number of helium nuclei emitted depends on the size and disintegration of the interacting nuclei. In order to explain the experimental data several possible production mechanisms have to be considered. Some characteristics of the emission of multiply charged projectile fragments were also studied. Author (NSA)

N74-34198# Oak Ridge National Lab., Tenn.
PHOTON SPECTRA FROM INDUCED ACTIVITY IN AN ORBITING SPACECRAFT
R. G. Alsmiller, Jr., G. T. Chapman, J. W. Wachter, and J. Barish May 1974 31 p refs

(Contract W-7405-eng-26)
(ORNL-TM-4345) Avail: NTIS HC $4.75

The results of nucleon-meson and photon transport calculations are presented, and an estimate is given of the photon spectrum from the induced activity in a spacecraft orbiting the earth and periodically passing through the Van Allen proton belt. A simplified slab model of the spacecraft is considered, but a realistic time dependence of the proton flux per unit energy for the orbit assumed is used. Results are given for a variety of times after the spacecraft has been in orbit. Author (NSA)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N74-34199*# Old Dominion Univ. Research Foundation, Norfolk, Va.
X-RAY EMISSION FROM HIGH TEMPERATURE PLASMAS Final Technical Report
Wynford L. Harries Jul. 1974 67 p refs
(Contract NAS1-11707)
(NASA-CR-132500) Avail: NTIS HC $3.75 CSCL 20I

X-rays from a 25-hJ plasma focus apparatus were observed with pinhole cameras. The cameras consist of 0.4 mm diameter pinholes in 2 cm thick lead housing enclosing an X-ray intensifying screen at the image plane. Pictures recorded through thin aluminum foils or plastic sheets for X-ray energies sub gamma smaller than 15 keV show distributed X-ray emissions from the focussed plasma and from the anode surface. However, when thick absorbers are used, radial filamentary structure in the X-ray emission from the anode surface is revealed. Occasionally larger structures are observed in addition to the filaments. Possible mechanisms for the filamentary structure are discussed. Author

N74-34200*# Santa Clara Univ., Calif. School of Engineering.
A STUDY OF THE METHODS FOR THE PRODUCTION AND CONFINEMENT OF HIGH ENERGY PLASMAS Final Report, 1 Apr. - 30 Sep. 1972
Dah Yu Cheng and Peter Wang 30 Sep. 1972 29 p refs
(Grant NGR-05-017-019)
(NASA-CR-140443) Avail: NTIS HC $4.50 CSCL 20I

The injection of dense plasmas into a B sub z long magnetic field from both ends of the field coil was investigated. Deflagration plasma guns and continuous flow Z-pinch are discussed along with the possibility of a continuous flow Z-pinch fusion reactor. The injection experiments are described with emphasis on the synchronization of the two plasma deflagration guns, the collision of the two plasma beams, and the determination of plasma density. F.O.S.

N74-34201# Paris Univ., Orsay (France).
THOMSON SCATTERING IN A CONFINED PLASMA CREATED BY IRRADIATING A SOLID WITH LASER IRRADIATION Ph.D. Thesis
C. Stenz 1973 108 p refs In FRENCH
(FRNC-TH-455) Avail: AEC Depository Libraries HC $8.50

The Thomson scattering of light by a plasma was used as a diagnostic method and for investigating transport phenomena and correlations in a plasma. The spatial resolution (1 cu mm) and temporal resolution (10 to 20 ns) obtained and the small perturbations introduced lead to a particularly suitable method for point measurements in laser-produced plasmas. This diagnostic was used to study the expansion and confinement of a plasma produced by irradiating a solid target with laser radiation in a mirror magnetic configuration. A device was developed for measuring the total intensity and spectral distribution (multichannel analyzer) of ruby laser light scattered through 90 deg for determining the density and electron temperature. NSA

N74-34202# Danish Atomic Energy Commission, Risoe.
CALCULATIONS OF PROPAGATION OF DENSITY PERTURBATIONS IN COLLISIONLESS PLASMAS
L. W. Joergensen and H. L. Pecseli Oct. 1973 41 p refs
(RISO-299) Avail: AEC Depository Libraries HC $5.25

Exact analytical solutions were obtained to the linearized, two-species Maxwell/Vlasov equations for the evolution of an initial density perturbation in an initially stable neutral plasma. The two initial perturbations considered are a step-like and a pulse-like discontinuity. Author (NSA)

N74-34203# Paris Univ. (France).
ABSORPTION OF A DENSE PLASMA IN THE X-UV REGION. APPLICATIONS TO STUDIES OF EXCITED STATE POPULATIONS AND THE X-RAY LASER Ph.D. Thesis
A. Carillon 1973 154 p refs In FRENCH
(FRNC-TH-459) Avail: AEC Depository Libraries HC $10.75

The absorption of X-UV radiation by a dense plasma produced by irradiating an aluminium target with a laser beam was studied. A new technique for measuring absorption was developed. As the lifetimes involved were very short, it was necessary to develop a synchronizing device acting between the plasma sample and the plasma source. The problem was resolved by using the same laser to produce the two generating beams. The sample possesses a self-emission which must be taken into consideration. This emission was introduced into the transfer equation. The extent to which fluctuations occurred led to the application of a fairly rigorous statistical treatment. Theoretical investigations enabled the significance of the quantity measured using this new plasma diagnostic technique to be demonstrated. It was possible to establish that the upper transition levels of 2p(6) S sub(0) - 2p(5) and 3p sub 1(0) of Al(3+) ions were heavily overpopulated and very near to population inversion. Emphasis is given to the part played by double-electron recombination which leads through the intermediate of the Al(4+) channel to off-equilibrium states. The overpopulations observed for an X-ray laser are discussed. NSA

N74-34204# Ecole Polytechnique Federale de Lausanne (Switzerland). Centre de Recherches en Physique des Plasmas.
DIAMAGNETIC PROBE MEASUREMENTS OF A THETA PINCH [MESURES DIAMAGNETIQUES D'UN THETA PINCH]
R. Keller Mar. 1974 32 p refs In FRENCH; ENGLISH summary
(LRP-78/74) Avail: NTIS HC $4.75

The formative and adiabatic phase of a theta pinch were investigated by diamagnetic probe measurements. Radial implosion was interpreted with the aid of an analytic shock wave model which enables the determination of the initial ionization and the mass collection. Measurements of temperature and mean beta value during the adiabatic compression were made for different deuterium pressures and preionization conditions. Author (ESRO)

N74-34205# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
THE VACUUM ARC AS A FACILITY FOR RELEVANT EXPERIMENTS IN FUSION RESEARCH Annual Report, 1972
C. Bastian, F. Boeschoten, H. Hekman, R. Komen, H. P. Riske, and A. Vanlersel Feb. 1973 25 p refs Prepared jointly with EURATOM
(TH-73-E-35; ISBN-90-6144-035-1) Avail: NTIS HC $4.25

A description of the apparatus is given along with available diagnostic tools. The plasma rotation and the related turbulent phenomena were measured. The experiments were started in February 1973 and some of the first results are given. Author (ESRO)

N74-34206# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
EXPERIMENTS WITH A LARGE SIZED HOLLOW CATHODE DISCHARGE FED WITH ARGON Annual Report, 1973
C. Bastian, F. Boeschoten, H. Hekman, R. Komen, H. P. Riske, and A. Fanlersel Apr. 1974 42 p refs Prepared jointly with EURATOM
(TH-74-E-45; ISBN-90-6144-045-9 Avail: NTIS HC $5.25

Several plasma parameters pertinent to the rotation of the plasma column of a hollow cathode discharge were measured. The ion temperature, Ti, was measured with a Fabry-Perot interferometer. Depending on arc current and gas flow, Ti may

be varied in an argon arc in the range from 1 to 10 eV. The magnetic field strength, B, is adjustable from 600 to 6000 gauss. The plasma column is fully ionized, and for higher values of Ti and B it is also fully magnetized. Simultaneous Doppler shift measurements of the A II line 4806 angstrom reveal that the plasma column rotates nonuniformly around its axis. At larger distances from the axis, the rotation was measured with a pendulum and with a directional Langmuir probe. The object of the experiments is to disclose the connection between this rotation and the stability of the plasma column. ESRO

N74-34207# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
THE HEATING OF THE JET PLASMA BY CURRENT-DRIVEN TURBULENCE
H. W. Piekaar and H. Dekluiver Dec. 1973 11 p refs Sponsored in part by Neth. Organ. for Pure Sci. Res. (ZWO) and EURATOM
(Rept-73-82) Avail: NTIS HC $4.00

A feasibility study for the heating of a Tokamak plasma to thermonuclear temperatures by current driven turbulence is presented. Two methods are evaluated which, assuming neoclassical losses, are sufficient to ignite the plasma. The first proposal implies that the full heating current of 6 MA is entirely supplied by the heating capacitor bank. This method requires 83 MJ at gap voltages not exceeding 46 kV. The second method is in two steps. After the preionization phase the normal stationary Tokamak poloidal field is induced. At its maximum of 3 MA the fast heating bank is discharged over the copper shell surrounding the plasma column. Energy requirements are then 31 MJ but require gap isolation up to 92 kV. Technological problems related to the unsegmented liner and segmented exterior conducting shell are discussed. ESRO

N74-34208# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
DESIGN AND TESTING OF CHEMICAL INJECTION SYSTEM FOR REENTRY PLASMA ALLEVIATION Physical Sciences Research Papers
John F. Lennon and Sheldon B. Herskovitz 28 Feb. 1974 48 p refs
(AF Proj. 4642)
(AD-780510; AFCRL-PSRP-588; AFCRL-TR-74-0113) Avail: NTIS CSCL 20/9

The effect of injecting an electrophilic liquid into the ionized flow field surrounding a reentry vehicle was observed during the flight of a trailblazer 2 on 28 July 1972. The report describes the rationale used to initially screen candidate additives and the experimental evaluation that finally resulted in the selection of Freon 114B2 for operational use. Injection system design and preliminary testing are discussed, and the predicted and actual performance during flight are compared. Data from on-board antennas and electrostatic probes confirmed that the additive reduced the electron density and improved transmission. A number of factors characterizing the injection are presented as a basis for analyzing the flow-additive interaction. Author (GRA)

N74-34209# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NONSELF-SUSTAINED STATIONARY GAS DISCHARGE IN N2-CO2 MIXTURES IONIZED BY AN ELECTRON BEAM AT ATMOSPHERIC PRESSURE
E. P. Velikhov, S. A. Golubev, Yu. K. Zemtsov, A. F. Pal, and I. G. Persiantsev 18 Jun. 1974 17 p refs Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (USSR), v. 65, no. 2, Apr. 1973 p 543-549
(FTD Proj. T74-05-14)
(AD-781632; FTD-HT-23-1979-74) Avail: NTIS CSCL 20/9

The author studied a nonself-sustained gas discharge in N2-CO2 mixtures at atmospheric pressure. An electron beam was used as the external ionizer. In the experiment stable burning of such a discharge in a steady-state regime was realized. This analysis shows promise in the use of such discharges as combined pumping of CO2 lasers. GRA

N74-34210# Air Force Weapons Lab., Kirtland AFB, N.Mex.
CALCULATIONS OF THICK TARGET X-RADIATION FOR CONTINUUM ELECTRON BEAMS INCIDENT UPON ALUMINUM, COPPER, MOLYBDENUM, AND TUNGSTEN TARGETS Final Report, May 1972 - Apr. 1974
David J. Johnson Jul. 1974 20 p refs
(AF Proj. 8809)
(AD-782096; AFWL-TR-74-130) Avail: NTIS CSCL 20/9

A Monte Carlo electron beam transport program is used to calculate thick target X-ray spectra for use when interpreting X-ray spectral data from plasma generators possessing superthermal electron components. Spectra are calculated for various monoenergetic and continuum electron beams between 5 and 300 keV normally incident upon Al, Cu, Mo, and W targets. Calculations are presented at detection angles of 95, 105, 115, 135, and 175 degrees with respect to the electron beam direction. Author (GRA)

N74-34211# AeroChem Research Labs., Inc., Princeton, N.J.
A COMPUTER CODE TO PREDICT THE EFFECTS OF ELECTROPHILIC LIQUID INJECTION ON RE-ENTRY PLASMA SHEATH PROPERTIES Final Report, 1 Oct. 1972 - 30 Nov. 1973
Harold S. Pergament and Chung-Jen Kau Jan. 1974 143 p refs
(Contract F19628-73-C-0045; AF Proj. 5635)
(AD-782023; AeroChem-TP-308; AFCRL-TR-74-0074) Avail: NTIS CSCL 20/9

A detailed description of a computer code to predict the influence of electrophilic liquid injection on re-entry plasma sheath properties is presented. The code requires input data on the liquid injection system parameters (i.e. electrophilic liquid properties, injection velocity, number of orifices, etc.) and the plasma sheath (shock layer) properties for no material addition, and predicts altered shock layer flow properties and species concentrations. Of primary interest is the ability of the code to predict reductions in shock layer electron concentrations, which determine the effectiveness of the injectant in alleviating re-entry blackout. (Modified author abstract) GRA

N74-34212# Stevens Inst. of Tech., Hoboken, N.J. Dept. of Physics.
PLASMA PRODUCTION BY BEAM-PLASMA DISCHARGE Ph.D. Thesis
Hsin Liu Apr. 1974 97 p refs
(Grant AF-AFOSR-2121-71; AF Proj. 9752-07)
(AD-782092; SIT-P281; AFOSR-74-0966TR) Avail: NTIS CSCL 20/9

Plasma production by a beam-plasma discharge in magnetic field has been experimentally investigated. The beam plasma instability occurring in the axial density gradient of a beam produced plasma is measured. Under the proper conditions the waves, with omega (omega sub c), will grow and decay completely in the inhomogeneous region. The decay is found to result from Landau damping of the wave by the beam. The spatial evolution of beam thermalization along the discharge has been measured. At beam to plasma density ratio smaller than 1/100 plasma production is dominated by the plasma electrons which are heated by rf fields resulting from beam-plasma interaction. The power balance of the beam-plasma interaction has been studied. (Modified author abstract) GRA

N74-34213# Army Foreign Science and Technology Center, Charlottesville, Va.
ROTATIONAL MOTION OF AN ELECTROCONDUCTIVE FIELD BETWEEN FINITE-SIZE DISKS IN CROSSED ELECTRIC AND MAGNETIC FIELDS
L. P. Gorbachev, V. S. Molashenko, and E. P. Potanin 16 Apr. 1974 9 p refs Transl. into ENGLISH from Magn. Gidrodin. (USSR), no. 3, 1971 p 91-94
(AD-782002; FSTC-HT-23-1850-73) Avail: NTIS CSCL 20/9

Axisymmetric rotational motion of an electroconductive fluid between dielectric disks of finite radius acted on by crossed electric and axial magnetic fields in the presence of boundary layers is examined. GRA

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N74-34214 British Library Lending Div., Boston Spa (England).
STUDY OF THE SYSTEM CaO-Fe2O3 WITH THE AID OF THE MOSSBAUER EFFECT: COMMUNICATION 1
Yu. S. Yusfin, Yu. B. Voitkovskii, L. I. Savitskaya, and O. N. Generalov [1974] 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 9, 1973 p 17-19
(BLL-M-21839-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Phase transformations in the system CaO-Fe2O3 were studied by the Mossbauer spectroscopy method. The primary product of the reaction of lime with ferric oxide in the solid state, irrespective of the ratio of the components in the starting mixture, is dicalcium ferrite. The temperatures at which formation of mono- and dicalcium ferrites starts were found, and are equal to 500 and 400 C, respectively. Author

N74-34215# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Experimentelle Kernphysik.
ELECTRON SINGLE PARTICLE STATES IN THE FLUXLINE LATTICE IN PURE TYPE-2-SUPERCONDUCTORS
G. Ries Jan. 1974 47 p refs In GERMAN; ENGLISH summary
(KFT-EXT-3-73-7) Avail: AEC Depository Libraries HC $5.50

In a pure type-II-superconductor containing a fluxline lattice energy eigenvalues and wave functions of electron single particle states are evaluated solving the Bogolyubov equations. Two classes of states are found, bound states which are localized around the fluxline axes and nonlocalized continuum states. The bound states have energies in the range of the BCS gap and are responsible for the gapless behavior of a type-II-superconductor in a magnetic field. The continuum states have merely a BCS-like spectrum. It is shown that the existence of gaps leads to a negative contribution to the free energy of the superconductor which depends upon the fluxline lattice parameter. This can be interpreted as an attractive interaction between fluxlines and explains the discontinuity in the magnetization at H sub c1 as observed in pure materials. Author (NSA)

N74-34216# Commissariat a l'Energie Atomique, Saclay (France).
ELECTRON EMISSION EXPERIMENTAL STUDY OF A (100) TUNGSTEN SINGLE CRYSTAL COVERED WITH CESIUM AND OXYGEN
J. L. Denisot Oct. 1973 51 p refs In FRENCH
(CEA-R-4508) Avail: AEC Depository Libraries HC $4.75

Thermionic converter efficiency was appreciably increased by oxygen additions. The cesium-oxygen (100) tungsten experiments were carried out by means of a thermionic electron emission microscope. In this device, the tungsten sample is exposed to two independent fluxes of cesium and oxygen. The experimental results are shown in the form of curves plotted on the one hand with emitted electron current and temperature, and on the other hand with work function and tungsten temperature over cesium temperature ratio. The oxygen partial pressure can reach some 0,000001 torr; the cesium temperatures being 315, 330 and 348 K. The oxygen addition generally leads to a large decrease in Cs-W work function. The minimum attainable work function was found to be about 1 eV. Author (NSA)

N74-34217# Argonne National Lab., Ill.
PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON MAGNETIC STRUCTURES IN SUPERCONDUCTORS
1973 105 p refs Conf. held at Argonne, Ill., 5-8 Sep. 1973
(Contract W-31-109-eng-38)
(ANL-8054; Conf-730978-Absts) Avail: NTIS HC $5.45

Fifty-two abstracts of the papers presented at the conference are given. The abstracts are arranged by sessions and deal with intermediate state, mixed state in type-1 superconductors, vortex structure, NMR, neutron diffraction, surface impedance, current-induced effects, flux jumps, vortex coupling, tunneling in thin films. A summary of the conference is also included. Author

N74-34218# Bhabha Atomic Research Centre, Bombay (India). Chemistry Div.
[RESEARCH PROGRESS IN PURE MATERIALS PREPARATION, RADIATION CHEMISTRY, AND SOLID STATE] Annual Progress Report, 1972
1973 197 p refs
(BARC-693) Avail: AEC Depository Libraries HC $12.00

The development of processes and actual preparation of high purity materials, elements, and compounds required in the electronics industry and in scintillation technology was reported. Processes were also developed to extract rare metals from different indigenous mineral sources. Research in organic chemistry was also reported. Author

N74-34219# California Univ., Berkeley. Lawrence Berkeley Lab.
CARBON-13 NMR SPECTRA AND SPIN ECHOES IN SOLIDS
A. Pines Mar. 1974 12 p refs Presented at the 15th Nucl. Magnetic Resonance Conf., Raleigh, North Carolina, 28 Apr. - 1 May 1974
(Contract W-7405-eng-48)
(LBL-2589; Conf-740432-1) Avail: NTIS HC $4.00

The use of carbon-13 NMR in solids as spectroscopic tool is discussed. Considered are instrumentation, experimental details, high resolution spectra in crystals, chemical shielding tensors and spin echoes. Author

N74-34220# United Kingdom Atomic Energy Authority, Harwell (England). Theoretical Physics Div.
GENERAL FORMULATION OF THE PROBLEM OF CALCULATING THE ENERGIES OF LATTICE DEFECTS IN IONIC CRYSTALS
M. J. Norgett Jan. 1974 52 p refs
(AERE-R-7650) Avail: NTIS HC $4.75

A unified approach to the problem of calculating energies of simple lattice defects in ionic crystals was developed. Consideration was given to the calculation of lattice energy, methods for minimising that energy to obtain the equilibrium lattice configuration, and suitable boundary conditions describing the lattice relaxation far from the defect. The discussion is within the context of an assumed rigid ion model for the ionic crystal except in the final section when the development is extended to a consideration of calculations using the more sophisticated shell model. Author

N74-34221# Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany).
FIT PROGRAM FOR MOESSBAUER SPECTRA
U. Morfeld Mar. 1974 63 p refs In GERMAN
(HMI-B-131) Avail: AEC Depository Libraries HC $6.25

A computer program for the evaluation of Moessbauer absorption spectra measured in the time mode is presented. With small changes, spectra measured in the velocity mode can also be processed. The mathematical methods used in the program are described. Each subprogram is described in detail. An example is given of the data imput and the printout of the results. The program is written in FORTRAN IV but can be used in other computer languages with some alteration. The program is given. NSA

N74-34222# Sandia Labs., Albuquerque, N.Mex.
HYDROGEN DISTRIBUTION PROFILING
R. A. Langley, S. T. Picraux, and F. L. Vook 1974 11 p refs Presented at the Hydrogen Econ. Miami Energy Conf., Miami Beach, Fla., 18 Mar. 1974 Sponsored by AEC
(SLA-73-5910; Conf-740306-2) Avail: NTIS HC $3.00

A technique using nuclear microanalysis has been developed to determine deuterium concentration versus depth profiles in the near surface regions of solids. The technique uses an incident He-3 beam and detects the nuclear reaction products from the reaction He-3(d,n)He4, as well as the Rutherford scattered He-3 from atoms of the solid. By energy analysis of the He-4 recoils the deuterium concentration depth profile can be determined. Details and results of the technique are presented for ErD2.

Using the same reaction the lattice location of 2D in single crystals can be determined. The technique utilizes deuterium implantation followed by analysis with a channeled He-3 beam. Results are presented for 2D in tungsten. Author

N74-34223# Sandia Labs., Albuquerque, N.Mex. Hybrid Engineering Div.

ACCELERATED LIFETESTING AND FAILURE MODES OF THIN FILM W CONTACTS ON SiGe THERMOELECTRIC ALLOYS

J. N. Sweet 1974 29 p refs Presented at the Intern. Reliability Phys. Symp., Las Vegas, Nev., 2 Apr. 1974 Sponsored by AEC (SLA-74-5168; Conf-740426-2) Avail: NTIS HC $4.50

The stability of sputtered thin film W contacts on heavily doped Si-Ge alloy was determined from measurements of contact resistance versus time for aging temperatures in the range 550 to 725 C. Contact failure time has been found to obey an Arrhenius type relation with an activation energy of 76 + or - 5 kcal/mole and a projected lifetime of over ten years at temperatures below 460 C. Contact resistance remains approximately constant for the first 80% of contact lifetime and then increases rapidly through several orders of magnitude. These large contact increases are accompanied by contact deadhesion and buckling. Comparison of this data with that from diffusion experiments indicates that the activation energy for contact failure is comparable with that for the initial stages of WSi2 layer growth in W-Si systems. Author (NSA)

N74-34224# National Inst. of Radiation Protection, Stockholm (Sweden).

SIGNAL TO NOISE RATIOS IN RADIATION DOSIMETRY USING SEMICONDUCTORS

S. A. Larsson and L. G. Bengtsson Jan. 1974 21 p refs (SSI-1974-8) Avail: AEC Depository Libraries HC $4.25

Signal-to-noise ratios are becoming important in radiation dosimetry when low radiation doses are to be measured using semiconducting diodes to detect either the ionizing radiation itself or the light emitted from a radiation sensitive transducer. The signal due to ionizing radiation in the diode is in the first case the primary signal but in the second case an unwanted by-product, the effects of which should be minimized. In both cases the noise contributions arise from the diode itself as well as from the amplifier used. Factors influencing the noise and the sensitivity of the semiconducting detectors are discussed, including biased and unbiased operation of the photodiode, and phase sensitive detection of the signal information. It was found that in most applications, factors other than the signal-to-noise ratio will govern the selection of the mode of operation. Author (NSA)

N74-34225# Systems Research Labs., Inc., Dayton, Ohio.

ION IMPLANTATION IN SEMI-CONDUCTORS AND SEMI-INSULATORS Interim Technical Report, Jan. 1972 - Jul. 1973

Elward T. Rodine, Bok Kyoon Shin, and Darrel L. Bartelheimer Apr. 1974 162 p

(Contract F33615-72-C-1099; AF Proj. 7885)

(AD-781193; SRL-6739-12; ARL-74-0025) Avail: NTIS CSCL 20/12

Ion implantation of II-VI semiconductors offers numerous possibilities for the fabrication of electronic devices. Several possibilities have been explored and are reported here. The electrical and optical properties of ion-implanted ZnSe and ZnS are reported and their suitability as surface contact injection devices, p-n junctions and light emitting diodes is discussed. The suitability of these materials for switching and memory devices is also discussed. The results of ion implantation are compared with the behavior of doped samples. The methods of material preparation are carefully considered and related to the experimental data. An experiment to measure the laser-induced absorption of II-VI compounds is discussed. Most of this discussion concerns the setup of the experiment and a mathematical analysis of the response times anticipated. The thermoluminescence of Br-implanted ZnS is compared with the behavior of Br-doped and pure samples of ZnS. Several methods for determining the regularity and depth of the implanted layers are described. Author (GRA)

N74-34226# Army Foreign Science and Technology Center, Charlottesville, Va.

CHANGES IN THERMAL, PHOTO, AND RADIATION STABILITIES OF SOLID INORGANIC COMPOUNDS

Yu. A. Zakharov and G. G. Savelev 7 Sep. 1973 40 p refs Transl. into ENGLISH from Izv. Politekhn. Inst. (Tomsk), v. 199, 1969 p 35-59

(AD-781216; FSTC-HT-23-1098-73) Avail: NTIS CSCL 07/2

The Russian review examines the decomposition of inorganic solids, especially salts, and the changes in decomposition rates and mechanisms induced by various external factors, including donor-acceptor action, catalytic impurities, electromagnetic fields, and light. Emphasis is on thermal decomposition processes. Included are 149 references. GRA

N74-34227# Varian Associates, Palo Alto, Calif.

GROWTH AND INVESTIGATION OF HEXAGONAL BORON NITRIDE Final Technical Report, 1 Mar. 1973 - 31 Mar. 1974

T. O. Yep Apr. 1974 14 p ref

(Contract N00014-73-C-0235; NR Proj. 243-009; RR0210203)

(AD-781292) Avail: NTIS CSCL 20/2

BN films have been chemically vapor deposited on various substrates. Ordered polycrystalline films are obtained on the (5,-6,1) Si substrate. A transit-charge-technique apparatus for the direct measurement of the carrier-drift velocity has been constructed and tested with drift-velocity measurements in Si. As yet, drift-velocity measurements on the BN films have not been successful. Author (GRA)

N74-34228# Aerospace Corp., El Segundo, Calif.

ADSORPTION OF Ag(I) ON TiO2 THIN FILMS AND SINGLE CRYSTAL SURFACE Interim Report

Paul D. Fleischauer and John R. Shepherd 27 Jun. 1974 21 p refs

(Contract F04701-73-C-0074)

(AD-781783; TR-0074(9270-02)-1; SAMSO-TR-74-126) Avail: NTIS CSCL 07/4

Adsorption of ions from solution is an important process in both photochemical and thermal electron transfer reactions on solid semiconductor surfaces. Isotherms are presented for the adsorption of silver ion from solutions of different ionic composition onto thin film and single crystal titanium dioxide surfaces. In every case the data fit the Langmuir model for adsorption. The effects of hydrogen ion, temperature, and the presence of silver nuclei on the degree of silver adsorption are considered. A mechanism is proposed in which the nature of a specific surface site in the Langmuir model is identified. These data and the implications of the adsorption mechanism are discussed in terms of their relationship to studies of the reduction of silver ion on titanium dioxide surfaces. Author (GRA)

N74-34229# Rice Inst., Houston, Tex. Materials Science Lab.

DYNAMIC MAGNETOELASTIC PROPERTIES OF RARE-EARTH MATERIALS Final Report, 5 Nov. 1971 - 30 Nov. 1973

Paul L. Donoho, Frank R. Brotzen, Kamel Salama, and Wayne C. Hubbell 30 Jun. 1974 75 p refs

(Contract DAAH01-72-C-0285; ARPA Order 1685)

(AD-781688) Avail: NTIS CSCL 20/12

Summary of the goals and accomplishments of a research program on the dynamic magnetoelastic properties of rare-earth materials is given. Both elastic wave propagation and elastic-wave ultrasonic generation were investigated in pure rare-earth metals and in terbium-iron compounds. Author (GRA)

N74-34230# Illinois Univ., Urbana. Dept. of Computer Science.

THE ENERGY TRANSPORT PROPERTIES OF ONE DIMENSIONAL ANHARMONIC LATTICES Ph.D. Thesis

Kenichi Miura 20 Jul. 1973 176 p refs

(PB-224409/3; UIUCDCS-R-73-586) Avail: NTIS HC $11.00 CSCL 20L

The energy transport properties of the solitary waves are studied both analytically and numerically. It was found that the piecewise linear function model clearly explains the characteristics

of such waves. Numerical experiments were performed extensively to clarify the various properties of the solitary waves in the one dimensional anharmonic lattice. These results were used to interpret the heat conduction problem of the crystal lattice.
Author (GRA)

N74-34231# California Univ., Riverside. Dept. of Physics.
A NOTE ON THE ANISOTROPY OF THE CONDUCTIVITY IN THIN AMORPHOUS FILMS
M. Pollak and J. J. Hauser Jul. 1974 15 p refs Prepared in cooperation with Bell Telephone Labs., Murray Hill, N. J.
(Contract N00014-69-A-0200-5005; NR Proj. 017-664)
(AD-782325) Avail: NTIS CSCL 20/12
A new interpretation of the anisotropy of the conductivity in thin films of a-Ge, and a-Si is presented. The interpretation is based on a transition, previously proposed by the other author, from percolation conduction to Miller and Abrahams conduction at small film thickness. A simple theory together with experimental data is presented. The comparison between them is found to be good. (Modified author abstract) GRA

N74-34232# Florida Atlantic Univ., Boca Raton. Dept. of Physics.
ELECTRICAL AND OPTICAL STUDIES OF DEEP IMPURITIES IN SEMICONDUCTORS Final Scientific Report, 1 Feb. 1972 - 30 Apr. 1974
John S. Blakemore May 1974 14 p refs
(Grant AF-AFOSR-2175-72; AF Proj. 9763)
(AD-782309; AFOSR-74-1040TR) Avail: NTIS CSCL 20/12
Content: Ionization energy, impurity conduction and magnetoresistance in GaAs doped with Mn; Photo-ionization of Mn acceptors in GaAs; Deduction of impurity state functions from photo-ionization properties; Free hole scattering by deep neutral acceptors; Hole capture cross-section of Hg(-) acceptors in Ge; Magnetophonon effect. GRA

N74-34233# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
INVESTIGATION OF TECHNICAL PROBLEMS IN GALLIUM ARSENIDE Semiannual Technical Report
Fred H. Eisen, John A. Higgins, and Ricardo R. Zucca 5 Mar. 1974 115 p refs
(Contract F19628-74-C-0038)
(AD-782469; SC563.7SATR; AFCRL-TR-74-0172; SATR-1) Avail: NTIS CSCL 09/1
A broad area of technological problems of GaAs is covered in this progress report. The goal is to make contributions that will improve the current technology of microwave devices. The devices considered here are the Schottky barrier FET (MESFET) and the IMPATT diode. The work reported here covers problems of growth and characterization of very thin high-conductivity epitaxial films and high-resistivity epitaxial films; some aspects of processing of MESFET devices; study of the RF performance of IMPATT diodes and its relationship with the material parameters; problems of growth and characterization of semi-insulating GaAs; use of proton bombardment to convert conductive layers into high-resistivity layers, and, finally, study of n-type doping of GaAs by ion implantation with particular emphasis on the annealing problems. (Modified author abstract) GRA

N74-34234# New South Wales Univ., Kensington (Australia).
ELECTRON PARAMAGNETIC RESONANCE STUDY OF GaAs SURFACES Annual Report, 1 Feb. 1973 - 31 Jan. 1974
D. Haneman Apr. 1974 27 p refs
(Grant DA-CRD-AFE-S92-544-71-G168;
DA Proj. 1Z6-24201-D-466)
(AD-782191; FE-440-7; FE-440-8) Avail: NTIS CSCL 20/2
The work has been devoted to using electron paramagnetic resonance (EPR) techniques to elucidate the nature of cleaved GaAs surfaces. When suitably covered with cesium and oxygen, they make efficient photoemitters of considerable practical value. An advanced experimental arrangement has been used to cleave specimens in ultra high vacuum (UHV) inside a microwave cavity while connected to a cryoprobe. The EPR signals from single crystals are several orders of magnitude smaller than from crushed powders studied hitherto. Nevertheless sufficient sensitivity has been obtained. The results indicate that oxygen adsorbs at low temperatures to form O2(-) ions with lesser probability than on surfaces of crushed powders. (Modified author abstract) GRA

N74-34235# Illinois Univ., Urbana. Materials Research Lab.
RESEARCH ON THE DYNAMIC STRUCTURE OF LIQUIDS, LIQUID CRYSTALS AND DISORDERED SOLIDS: RESEARCH ON SEMICONDUCTOR MATERIALS AND DEVICES Annual Technical Report, 1 Jan. 1973 - 31 May 1974
Robert J. Maurer Jul. 1974 34 p refs
(Grant DAHC15-73-G-10)
(AD-781956; UILU-ENG-74-3402) Avail: NTIS CSCL 20/12
The dynamic structure of liquids and disordered solids is investigated by Rayleigh, Brillioin and Raman light scattering, by nuclear magnetic resonance and by infrared absorption. Simple liquids, liquid crystals, polymers, glasses, organic semiconductor and hydrogen in metals are the objects of investigation. The properties of light emitting and laser diodes of the semiconductors GaAsP, InGaAs, and InGaP are investigated to improve and extend their behavior. Impurities and imperfections in silicon which affect the properties of solid state devices are investigated for the purpose of controlling and improving device performance.
Author (GRA)

N74-34236# Massachusetts Inst. of Tech., Cambridge. Center for Materials Science and Engineering.
RESEARCH IN MATERIALS SCIENCE Semiannual Technical Report, 1 Jan. - 30 Jun. 1974
D. J. Epstein, R. M. Rose, M. MacVicar, R. Lagow, and R. Pelloux 30 Jun. 1974 185 p refs
(Contract DAHC15-73-C-0316)
(AD-782573; SATR-2) Avail: NTIS CSCL 20/6
The report presents the results and status of work after the second six month period of work on this research program. The work consists of five separate tasks involving research in materials science; namely: Optoelectronic materials and components - miniaturized and thin film laser sources and modulators; Superconducting transition metal alloys; Chemical synthesis using high temperature lithium vapor species; Fatigue and fracture properties of austenitic steels; and, Materials characterization using light scattering spectroscopy. GRA

N74-33983* Joint Publications Research Service, Arlington, Va.
SOME CHARACTERISTIC FEATURES OF THE CONSTRUCTION OF THE AMPLIFYING CHANNEL FOR WORKING WITH SEMICONDUCTOR DETECTORS IN THE CHARGED PARTICLE ENERGY SPECTROMETER
E. I. Kuzyuta *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 37-43 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 7 p (For availability see N74-33976 23-15)
CSCL 20L

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N74-34237# Institut Franco-Allemand de Recherches, St. Louis (France).
INTERIOR BALLISTIC MATHEMATICAL MODEL IN LAGRANGE COORDINATES [INNENBALLISTISCHES RECHENMODELL IN LAGRANGESCHEN KOORDINATEN]
G. Krauth 8 Apr. 1974 9 p In GERMAN Presented at the Conf. on Innenballistik fuer Rohrwaffen, Weil, West Ger., 22-23 Nov. 1973
(ISL-CO-5/74) Avail: NTIS HC $4.00
A gas dynamic mathematical model was programmed for interior ballistic calculations. The basic equations and formula system used are described. To simplify the program and for lack of sufficient input data, the following assumptions were made: powder particles and combustion gases propagate at

the same rate; the combustion products are treated as a homogeneous gas with no post reactions. These assumptions may be taken away later. The program was tested and the first experimental calculations were carried out. The absolute values of pressure do not yet cover the experimentally experienced results. ESRO

N74-34238# European Space Research Organization, Paris (France).
OPTIMIZATION OF HYPERSONIC FUELS BASED ON C3 AND C4 OLEFIN OLIGOMERIZATES BY n-PARAFFINS
Robert Erlmeier May 1974 32 p refs Transl. into ENGLISH of Optimierung von Ueberschallkraftstoffen aus Oligomerisaten von C3 u. C4 Olefinen durch n-Paraffine, DLR-FB-73-32, DFVLR, 17 Jan. 1973
(ESRO-TT-57; DLR-FB-73-32) Avail: NTIS HC $4.75; DFVLR, Porz, West Ger. 11.50 DM

The influence of n-paraffins with chains containing between ten and sixteen carbon atoms on the physical and chemical properties of four C3/C4 polymer fuels that were produced by means of hydrogenation of olefin oligomerizates was investigated. The properties of mixtures of polymer fuels and n-paraffins, at least up to paraffin contents of 25% by weight, are primarily determined by the chain length of the n-paraffin, and not by either the constitution or the degree of methylation of the polymer fuels. Low-temperature viscosity, vapor pressure, energy content, and combustion behavior of the polymer fuels can be optimized by the addition of n-paraffins at the expense of the melting point. The type and the quantity of n-paraffin that may be added will depend on the fuel specifications that have to be met in each particular case. Supersonic fuels that comply with the present maximum requirements for use in the range of Mach 3 can be optimized with the help of n-dodecane and n-tridecance. Author (ESRO)

N74-34239# Naval Research Lab., Washington, D.C.
HYDROGEN AS A NAVY FUEL
H. W. Carhart, W. A. Affens, B. D. Boss, R. N. Hazlett, and S. Schuldiner 12 Jun. 1974 39 p refs
(AD-781262; NRL-7754) Avail: NTIS CSCL 21/4

The report examines various factors relating to the possible use of hydrogen by the Navy as an alternate to conventional fuels. Properties, production, storage, hazards, handling, toxicity, and comparative costs of hydrogen in gaseous or liquid forms are discussed. GRA

N74-34240# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
COMPREHENSIVE BIBLIOGRAPHY OF LITERATURE ON NONCRYOGENIC STORAGE AND RECOVERY OF HYDROGEN
P. A. Kuntz, W. W. Wimer, W. D. Weatherford, Jr., and R. D. Quillian Sep. 1973 104 p refs
(Contract DAAK02-73-C-0221)
(AD-780928; AFLRL-30) Avail: NTIS CSCL 21/4

The chronological annotated bibliography has been compiled from the scientific literature for the noncryogenic storage of hydrogen for use as a fuel in a mobile vehicle. The bibliography covers a period of sixty-eight years (1905-1973) and is organized into two separate chronological bibliographies, each arising from different sources. These two primary sources are Chemical Abstracts and the Defense Documentation Center at Alexandria, Virginia. Topics covered include generation via decomposition and reaction of hydrides, metals, and other organic and inorganic compounds, biochemical generation, and various other storage means. (Modified author abstract) GRA

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N74-34241*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATUS OF 30 cm MERCURY ION THRUSTER DEVELOPMENT
J. S. Sovey and H. J. King (Hughes Research Labs., Malibu, Calif.) 1974 25 p Presented at the 10th Propulsion Conf., San Diego, Calif., 21 - 23 Oct. 1974; sponsored by AIAA and SAE
(NASA-TM-X-71603; E-8087) Avail: NTIS HC $3.00 CSCL 21C

Two engineering model 30-cm ion thrusters were assembled, calibrated, and qualification tested. This paper discusses the thruster design, performance, and power system. Test results include documentation of thrust losses due to doubly charged mercury ions and beam divergence by both direct thrust measurements and beam probes. Diagnostic vibration tests have led to improved designs of the thruster backplate structure, feed system, and harness. Thruster durability is being demonstrated over a thrust range of 97 to 113 mN at a specific impulse of about 2900 seconds. As of August 15, 1974, the thruster has successfully operated for over 4000 hours. Author

N74-34242*# Atkins and Merrill, Inc., Ashland, Mass.
CYCLIC FATIGUE ANALYSIS OF ROCKET THRUST CHAMBERS. VOLUME 1: OFHC COPPER CHAMBER LOW CYCLE FATIGUE
Roy W. Miller Jun. 1974 69 p refs 2 Vol.
(Contract NAS3-17807)
(NASA-CR-134641-Vol-1) Avail: NTIS HC $6.50 CSCL 21H

A three-dimensional finite element elasto-plastic strain analysis was performed for the throat section of a regeneratively cooled rocket combustion chamber. The analysis employed the RETSCP finite element computer program. The analysis included thermal and pressure loads, and the effects of temperature dependent material properties, to determine the strain range corresponding to the chamber operating cycle. The analysis was performed for chamber configuration and operating conditions corresponding to a hydrogen-oxygen combustion chamber which was fatigue tested to failure. The computed strain range at typical chamber operating conditions was used in conjunction with oxygen-free, high-conductivity (OHFC) copper isothermal fatigue test data to predict chamber low-cycle fatigue life. Author

N74-34243*# Atkins and Merrill, Inc., Ashland, Mass.
CYCLIC FATIGUE ANALYSIS OF ROCKET THRUST CHAMBERS. VOLUME 2: ATTITUDE CONTROL THRUSTER HIGH CYCLE FATIGUE
Roy W. Miller Jun. 1974 41 p refs 2 Vol.
(Contract NAS3-17807)
(NASA-CR-134641-Vol-2) Avail: NTIS HC $5.25 CSCL 21H

A finite element stress analysis was performed for the film cooled throat section of an attitude control thruster. The anlaysis employed the RETSCP finite element computer program. The analysis included thermal and pressure loads, and the effects of temperature dependent material properties, to determine the strain range corresponding to the thruster operating cycle. The configuration and operating conditions considered, correspond to a flightweight integrated thruster assembly which was thrust pulse tested. The computed strain range was used in conjuction with Haynes 188 Universal Slopes minimum life data to predict throat section fatigue life. The computed number of cycles to failure was greater than the number of pulses to which the thruster was experimentally subjected without failure. Author

N74-34244*# Atkins and Merrill, Inc., Ashland, Mass.
RETSCP: A COMPUTER PROGRAM FOR ANALYSIS OF ROCKET ENGINE THERMAL STRAINS WITH CYCLIC PLASTICITY
Roy W. Miller Jun. 1974 168 p refs
(Contract NAS3-17807)
(NASA-CR-134640) Avail: NTIS HC $11.50 CSCL 21H

A computer program, designated RETSCP, for the analysis of Rocket Engine Thermal Strain with Cyclic Plasticity is described. RETSCP is a finite element program which employs a three dimensional isoparametric element. The program treats elasto-plastic strain cycling including the effects of thermal and pressure loads and temperature dependent material properties. Theoretical

aspects of the finite element method are discussed and the program logic is described. A RETSCP User's Manual is presented including sample case results. Author

N74-34245*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIQUID ROCKET ENGINE TURBINES NASA Space Vehicle Design Criteria (Chemical Propulsion)
Jan. 1974 158 p refs
(NASA-SP-8110) Avail: NTIS HC $5.00 CSCL 21E

Criteria for the design and development of turbines for rocket engines to meet specific performance, and installation requirements are summarized. The total design problem, and design elements are identified, and the current technology pertaining to these elements is described. Recommended practices for achieving a successful design are included. F.O.S.

N74-34246*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
RCS PROPULSION FUNCTIONAL PATH ANALYSIS FOR PERFORMANCE MONITORING FAULT DETECTION AND ANNUNCIATION
E. L. Keesler Jul. 1974 124 p
(Contract NAS9-12200)
(NASA-CR-140258; LEC-3594; JSC-09130) Avail: NTIS HC $9.25 CSCL 21H

The operational flight instrumentation required for performance monitoring and fault detection are presented. Measurements by the burn through monitors are presented along with manifold and helium source pressures. M.C.F.

N74-34247*# Hughes Research Labs., Malibu, Calif. Ions Physics Dept.
A 2.5 kW ADVANCED TECHNOLOGY ION THRUSTER Final Report, 10 Oct. 1972 - 10 Apr. 1974
R. L. Poeschel Aug. 1974 175 p refs
(Contract NAS3-16949)
(NASA-CR-134687) Avail: NTIS HC $5.00 CSCL 21C

A program has been conducted in order to improve the performance characteristics of 30 cm thrusters. This program was divided into three distinct, but related tasks: (1) the discharge chamber and component design modifications proposed for inclusion in the engineering model thruster were evaluated and engineering specifications were verified; (2) thrust losses which result from the contributions of double charged ions and nonaxial ion trajectories to the ion beam current were measured and (3) the specification and verification of power processor and control requirements of the engineering model thruster design were demonstrated. Proven design modifications which provide improved efficiencies are incorporated into the engineering model thruster during a structural re-design without introducing additional delay in schedule or new risks. In addition, a considerable amount of data is generated on the relation of double ion production and beam divergence to thruster parameters. Overall thruster efficiency is increased from 68% to 71% at full power, including corrections for double ion and beam divergence thrust losses. Author

N74-34248# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
FILM COOLING WITH EJECTION FROM A ROW OF INCLINED CIRCULAR HOLES. AN EXPERIMENTAL STUDY FOR THE APPLICATION TO GAS TURBINE BLADES
Christian Liess Mar. 1974 110 p refs
(VKI-TN-97) Avail: NTIS HC $8.50

Film cooling with ejection of the coolant from a row of holes is the only practical way to apply this cooling mehtod to gas turbine blades. Measurements of the adiabatic wall effectiveness and the heat transfer coefficient on a flat plate downstream of a row of ejection holes are described. The effect of the principal flow parameters is studied for ejection of hot air into a cold air main flow. Laterally averaged values are measured for an ejection angle of 35 deg and a spacing diameter ratio of 3. Ejection at a stagnation point is also investigated. The main test conditions, such as main flow Mach numbers, pressure gradients, and boundary layer properties are determined according to experiments on a cascade of typical turbine blade profiles. Application of the results to film cooled gas turbine blades is, therefore, possible. Author (ESRO)

N74-34249# Loughborough Univ. of Technology (England). Dept. of Mathematics.
HYBRID FINITE ELEMENT OPTIMIZATION PROGRAMS FOR DISCS USING A DYNAMICS DESIGN TECHNOLOGY
B. M. E. deSilva and G. N. C. Grant Mar. 1974 31 p refs
Presented at the 12th AIAA Aerospace Sci. Meeting, Washington, D. C., 30 Jan. - 1 Feb. 1974
(MATHS-RES-35; Paper-74-103) Avail: NTIS HC $4.75

A finite element representation for a suite of dual nonlinear programs is described arising in the optimal weight-frequency design of turbine disks. The investigation is an attempt at obtaining independent confirmation of solutions based on an optimal control formulation of the synthesis in conjuction with Pontryagin maximum principle. The finite element analysis is the Pian-Tong extremization of the complementary energy functional for axisymmetric trapezoidal elements. The associated nonlinear programs are solved using the SUMT penalty function technique together with the variable metric method of Davidon-Fletcher-Powell. Author (ESRO)

N74-34250# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flugsimulation.
A HYBRID ELECTROHYDRAULIC STICK-FORCE-SIMULATOR
Friedrich Erdmann, Rudolph Dierke, and Eckhardt Biertuempel Porz 3 Aug. 1973 46 p refs In GERMAN; ENGLISH summary
(DLR-FB-73-99) Avail: NTIS HC $5.50; DFVLR, Porz, West Ger. 12 DM

The development of a mathematical model for the artificial representation of control stick loads is described. The nonlinear model is realised by hybrid computing elements, an electric force sensitive device and an electrohydraulic servo system. The result of investigation is a compact and flexible control force system. Damping, Coulomb-friction and stick inertia are adjustable. The trim-point and the gradient are controllable by analog as well as digital simulation processors. The midpoint can be marked by a notch or break-out force. Author (ESRO)

N74-34251# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ALPHA AND OMEGA OF ROCKET ENGINE-BUILDING
V. Glushko 18 Jun. 1974 7 p refs Transl. into ENGLISH from Pravda (Leningrad), no. 239, 1973 p 4
(AD-781310; FTD-HT-23-2427-74) Avail: NTIS CSCL 21/8

A background analysis of liquid propellant rocket engine design is presented. The development of auxiliary liquid propellant rocket engines for boosting the performance of combat aircraft is discussed. The application of liquid propellant rocket engines for spacecraft launch and propulsion is reported. The characteristics of the liquid propellant rocket engines which promote their use for spacecraft are defined. Author

N74-34252# AiResearch Mfg. Co., Phoenix, Ariz.
SMALL TURBINE ENGINE NOISE REDUCTION. VOLUME 6, PART 2: DUCT DESIGN AND ATTENUATION PROGRAM USER'S MANUAL Final Report, 7 May 1971 - 31 May 1973
W. M. Gipson and B. M. Goodman Dec. 1973 59 p refs
(Contract F33615-71-C-1457; AF Proj. 3066)
(AD-780534; AiResearch-73-210285-6-Pt-2; AFAPL-TR-73-79-Vol-6-Pt-2) Avail: NTIS CSCL 21/5

Vol. 6, Part 2, presents a computational package that designs attenuated duct systems for achieving predetermined attenuation increments or predicts those increments for previously determined duct and attenuator configurations. Two basic approaches have been used in this task--one entirely empirical in its development, and the other theoretically based. Author (GRA)

N74-34253# Army Foreign Science and Technology Center, Charlottesville, Va.
THE YaMZ240 ENGINE AND ITS MODIFICATIONS
G. D. Chernysheva Nov. 1973 258 p Transl. into ENGLISH

of unidentified RUSSIAN book Moscow, Mashinostroenie, 1972 230 p
(AD-781197; FSTC-HT-23-216-73) Avail: NTIS CSCL 21/7

The book gives a description of the construction of the new 12-cylinder engine YaMZ-240 (Yaroslavl/Motor Plant) and its modifications, the principles of the operation of the engine and its assemblies, a detailed examination of the construction of its units and parts, as well as the gas turbine supercharge assemblies of the YaMZ-240N Engine. Recommendations are made on the operation and technical maintenance of the engines, and the fuels and lubricants to be used; essential information is provided on adjusting, as well as specific recommendations with respect to repairs. Author (GRA)

N74-34254# AiResearch Mfg. Co., Torrance, Calif.
CONDENSER AND FAN DEVELOPMENT FOR RANKINE CYCLE ENGINES
J. Killackey, R. Morgan, C. Morse, B. Foster, and C. Lee Nov. 1973 245 p refs
(Contract EPA-68-01-0407)
(PB-232502/5; EPA-460/3-73-007) Avail: NTIS HC $6.00 CSCL 21E

The primary goal of the program is to develop a high performance condenser and fan system for each of three Rankine cycle automotive power plants now under development by the Environmental Protection Agency. This report includes the following: (1) condenser design, fabrication and heat transfer performance tests; (2) fan design fabrication and testing; (3) condensing heat transfer tests; and (4) perforated fin development. Three different condensers were designed to meet the specific performance requirements of the three Rankine cycle engines. Each unit was configured to fit within the confines of the specified engine compartment. Detailed structural analyses were conducted to ensure that the units would withstand the expected pressure and temperature operating conditions. Author (GRA)

N74-34255# Pratt and Whitney Aircraft, East Hartford, Conn.
EVALUATION OF AN ELECTROSTATIC PROBE TECHNIQUE FOR DETECTING IMMINENT FAILURE OF GAS TURBINE ENGINES Final Technical Report, 1 Nov. 1972 - 30 Jan. 1974
Robert E. Harper Apr. 1974 141 p refs
(Contract F33615-73-C-2034; AF Proj. 3066)
(AD-782442; PUA-4905; AFAPL-TR-74-18) Avail: NTIS CSCL 21/5

Investigations conducted by the USAF established that an electrostatic probe installed in the tailpipe of a gas turbine engine might be used with suitable electrical measuring equipment to detect the presence of small metal particles entrained in the exhaust gas. If the number of particles detected per unit time could be correlated with engine distress, the system would have great practical value in detecting imminent failure. The system was evaluated on JT9D, TF30 and J52 experimental engines over a wide range of engine operating conditions. Probe signals were characterized for engines without known distress and in a few unplanned instances, for engines operating in a distressed condition. Time averaged particle count rates for normal engines varied over a wide range, but there was no significant correlation with engine model or operating power condition. In three of four instances, engines operating in a distressed condition yielded average particle count rates an order of magnitude higher than normal engines, but in the fourth instance the particle count rate was within the normal range. In one attempt to simulate distress by injecting particles into an engine, the probe system surprisingly did not respond. (Modified author abstract) GRA

N74-34256# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DESIGN AND TESTING OF THE FLOW-THROUGH PART OF A GAS-TURBINE ENGINE
V. K. Dondoshanskii and V. F. Dergach 20 Jan. 1974 21 p Transl. into ENGLISH from the book "Raschet i Ispytaniya Protochnoi Chasti Gazoturbinnogo Dvigatelya" Leningrad, 1972 p 115-124
(AD-782542; FTD-HC-23-1627-74) Avail: NTIS CSCL 21/5

A method for determining the air flow characteristics of a gas turbine engine is disucssed. The distortions of the universal characteristics, obtained during simulation, create the following problems: (1) construction of the universal characteristics of the new compressor from the available characteristics of the initial model and from the data on the effect of unsimulable factors on the parameters of the stages and (2) introduction of corrections into the configuration of the new compressor, which would permit restoration of its characteristics at least in pressure and flow rate and only in the zone of the model point. Mathematical models and graphs are provided to support the theoretical considerations. Author

N74-33477* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BLADE DESIGN
Warner L. Stewart and Arthur J. Glassman *In its* Turbine Design and Appl. Vol. 2 1973 p 1-25 refs (For availability see N74-33476 23-03)
CSCL 21E

N74-33478* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHANNEL FLOW ANALYSIS
Theodore Katsanis *In its* Turbine Design and Appl., Vol. 2 1973 p 27-56 refs (For availability see N74-33476 23-03)
CSCL 21E

N74-33481* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MISCELLANEOUS LOSSES
Richard J. Roelke *In its* Turbine Design and Appl., Vol. 2 1973 p 125-148 refs (For availability see N74-33476 23-03)
CSCL 21E

N74-34416 National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
PROSPECTS FOR VARIABLE GEOMETRY COMPRESSORS IN AUTOMOTIVE GAS TURBINES
G. M. Shulhan *In its* Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 30 Jun. 1974 p 15-24 refs (For availability see N74-34414 23-34)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N74-34257*# Stanford Univ., Calif. Inst. for Plasma Research.
THE SOLAR ATMOSPHERE AND THE STRUCTURE OF ACTIVE REGIONS Semiannual Report, 1 Jan. - 30 Jun. 1974
P. A. Sturrock Sep. 1974 27 p refs
(Grant NGL-05-020-272)
(NASA-CR-140003; SAR-5) Avail: NTIS HC $4.50 CSCL 03B

The existence of 'holes' in the corona is reported characterized by abnormally low densities and temperatures. It was found that such coronal holes appear to be the source of high-velocity, enhanced-density streams in the solar wind as observed at the earth's orbit. It was further noted that coronal holes appear to be associated with regions of diverging magnetic fields in the corona. Models were developed to accomplish the objective for the principal energy flows in the transition region and corona. M.C.F.

N74-34258*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EFFECTS OF SIMULATED SOLAR RADIATION ON THE TRANSMISSION OF MAGNESIUM FLUORIDE AND CRYOLITE THIN FILMS
Thomas Heslin Washington Sep. 1974 10 p refs
(NASA-TN-D-7745; G-7461) Avail: NTIS HC $3.00 CSCL 03B

Thin films of cryolite magnesium fluoride on fused silica substrates were exposed to 1126 equivalent sun-hours of

radiation. The optical transmissions of the samples were measured before and after irradiation. The results indicate that, after the degradation of the silica substrate is accounted for, the cryolite is severely affected by the simulated solar radiation, but the magnesium fluoride is only slightly affected. Author

N74-34259*# Franklin Inst., Swarthmore, Pa. Bartol Research Foundation.
STRUCTURAL AND SPECTRAL STUDIES OF SUNSPOTS Final Report, 1 Sep. 1967 - 31 Aug. 1974
Arne A. Wyller 9 Oct. 1974 76 p refs
(Grant NGR-39-005-066)
(NASA-CR-140395) Avail: NTIS HC $7.00 CSCL 03B

Observations of umbral cores, both by multicolor photometry and by narrow band photometry in the vicinity of the sodium D lines, are described, and evidence is given which supports the validity of many umbral models, each of which describes different aspects of the observed umbral cores. Theoretical studies carried on at the observatory include the following: (1) Zeeman profiles of the sodium D sub 2 line and other lines; (2) turbulent heat conduction, sound waves, and the missing flux in sunspots; (3) chromospheric heating above spots by Alfven waves; (4) magnetic convection in the sun and solar neutrinos; (5) models of starspots on flare stars; (6) starspots on the primaries of contact binary systems; and (7) implications of starspots on red dwarfs. A.A.D.

N74-34260*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A CALCULATIONAL APPROACH TO ELECTRON IMPACT EXCITATION OF IONS IN HOT SOLAR PLASMAS
A. Temkin Sep. 1974 15 p refs Submitted for publication (NASA-TM-X-70755; X-602-74-260) Avail: NTIS HC $4.00 CSCL 03B

The cross section requirements are presented for studying UV and X-ray emission spectra associated with active and flare-produced plasmas in the sun's corona. The general approach to the calculation of the distorted wave approximation problem is also given. M.C.F.

N74-34261*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A COMPARISON OF ELECTRIC AND MAGNETIC FIELD DATA FROM THE OGO-6 SPACECRAFT
R. A. Langel Aug. 1974 34 p refs Submitted for publication (NASA-TM-X-70752; X-922-74-253) Avail: NTIS HC $4.75 CSCL 03B

Electric and magnetic field disturbance characteristics from OGO-6 were studied. Examination of simultaneous patterns of disturbance below 600 km over the summer polar cap showed that pattern changes in electric field and in the disturbance in magnetic field magnitude are highly correlated. This correlation extends to pattern shapes boundary locations, and to the amplitudes of the correlated quantities. In the winter hemisphere, at altitudes above 800 km, correlations between boundaries exist, pattern correlations are present, and amplitute correlations are essentially absent. Below 600 km the region of positive delta B, from 2200 to 1000 MLT, has a significant contribution from ionospheric and nonionospheric sources. Above 800 km the nonionospheric sources dominate. Author

N74-34262*# Scientific Translation Service, Santa Barbara, Calif.
SOLAR PROCESSES AND THEIR OBSERVATIONS
Yu. M. Slonim, ed. Washington NASA Oct. 1974 190 p refs Transl. into ENGLISH of the book "Solnechnyye Protsessy i ikh Nablyudeniya" Tashkent, FAN Press, 1973 p 1-125
(Contract NASw-2483)
(NASA-TT-F-15749) Avail: NTIS HC $12.50 CSCL 03B

Investigations of the physics, dynamics, and interrelations of processes which develop in active regions of the sun are described, along with an analysis of apparatus applicable for solar observations and the conditions of the observations themselves. A model of the inhomogeneous chromosphere was also developed. Author

N74-34263# Potchefstroom Univ. for Christian Higher Education (South Africa). Dept. of Physics.
COSMIC RAY NEUTRON MONITOR DATA SANAE, ANTARCTICA, FEBRUARY 1973 - JANUARY 1974
Sep. 1974 51 p
(Rept-S.8) Avail: NTIS HC $5.75

The counting rate of the 18NM-64 monitor at Kiel is used again for the graphical comparison of Sanae with another high counting rate high latitude neutron monitor. The normalization factors used for the graphical representation of the total corrected counting rates were 6528,9 for Kiel and 1462,0 for Sanae. As for previous years there was a perceptible slight seasonal variation in the Sanae counting rate in comparison with the counting rate of the neutron monitor at Kiel, which may be due to atmospheric temperatures at Sanae. There is also 'n shift in the mean ratio for 1973 according to previous years as a result of the fact that the neutron monitor was taken apart and reassembled at the beginning of the year. Author

N74-34264# Atomic Energy Commission, New York. Health and Safety Lab.
OPERATING MANUAL FOR GRANIA: A CODE FOR THE ANALYSIS OF CLIMATIC EFFECTS ON NATURAL ENVIRONMENTAL GAMMA-RAY EXPOSURE RATES
G. deP. Burke and K. OBrien Apr. 1974 14 p refs
(HASL-283) Avail: NTIS HC $4.00

A computer code (GRANIA) was developed to determine the effect of climatic factors on the background exposure rate from gamma sources in the ground. The input to the code is described and a sample calculation given. The code takes into account variations both in water storage within the soil-water medium and in surplus water, and their effect on gamma levels. It is written in FORTRAN 4 for the IBM 360-30. Author (NSA)

N74-34265# Institut Royal Meteorologique de Belgique, Brussels.
ANALYTICAL REPRESENTATION OF LUMINOUS SOLAR RADIATION COMPONENTS. CLEAR SKY CONDITIONS [REPRESENTATIONS ANALYTIQUES DES COMPOSANTES DU RAYONNEMENT LUMINEUX SOLAIRE. CONDITIONS DE CIEL SEREIN]
R. Dogniaux 1974 27 p refs In FRENCH
(Publ-Ser-A-83) Avail: NTIS HC $4.50

Various components of luminous solar rays under clear sky conditions were analyzed. Parameters characterizing atmospheric transparence were determined. The direct luminosity component is described mathematically and the luminous efficiency of direct solar radiation is discussed. Mathematical formulas for the diffuse luminosity component and the zenithal luminosity are given. The luminous efficiency of diffuse solar radiation is dealt with. ESRO

N74-34266# Instituto Geografico y Catastral, Madrid (Spain). Seccion de Geomagnetismo y Aeronomia.
CONTRIBUTION TO THE STUDY OF THE MAGNETIC STORMS ON 15 MAY AND 17 JUNE 1972 [CONTRIBUCION AL ESTUDIO DE LAS TORMENTAS MAGNETICAS DE LOS DIAS 15 DE MAYO Y 17 DE JUNIO DE 1972]
Fernando AranazydelRio 1973 56 p refs In SPANISH
Avail: NTIS HC $6.00

The magnetic storms on 15 May and 17 June 1972 are analyzed in terms of K index Z and H magnetic field components, declination, mean faculae number, solar flux at one AU, cosmic radiation, neutron flux, and radio wave transmission in decametric wavelengths. The results are correlated to those of Pioneer 6 and ATS-1. From the collected results, the hypothesis is made that the study of the main phase of a geomagnetic storm is reducible to the study of magnetospheric substorms. The hypothesis is substantiated by a correlation with sudden commencements of the ssc and ssc* types. ESRO

N74-34267# Genoa Univ. (Italy). Ist. Geofisico e Geodetico.
GLOBAL AND DIFFUSE SOLAR RADIATION AT GENOA UNIVERSITY AND MONTE CAPELLINO, JANUARY - DECEMBER 1973
1973 50 p In ITALIAN; ENGLISH summary Sponsored by CNR
Avail: NTIS HC $5.50

Solar global and diffuse radiation data, as recorded from January to December 1973 at Genoa University and Genoa-Monte Capellino using a Moll (Kipp) thermopile, are listed. ESRO

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N74-34268# Joint Publications Research Service, Arlington, Va.
SPACE RESEARCH CONDUCTED IN THE USSR IN 1973 COSPAR REPORT, 17TH PLENARY SESSION
M. I. Shtern, ed. 30 Aug. 1974 119 p Transl. into ENGLISH of the book "Kosmicheskiye Issledovaniya, Vypolnennyye v SSSR v 1973 Godu Doklad KOSPAR, Semnadtsatyy Plenum" Moscow, Izdatelstvo Nauka, 1974 p 1-91
(JPRS-62861) Avail: NTIS HC $9.00

Exploration and use of outer space for scientific and national economic goals conducted in the U.S.S.R. in 1973 are reviewed. Studies of the moon, planets, cosmic rays, and upper atmosphere are included. Author

N74-34269*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DATA CATALOG OF SATELLITE EXPERIMENTS. SUPPLEMENT 2B: PARTICLES AND FIELDS
Oct. 1974 93 p
(NASA-TM-X-72528; NSSDC-74-15B-Suppl-2B) Avail: NTIS HC $7.75 CSCL 22C

Each data set contained in this catalog lists spacecraft characteristics, experiment personnel, and a brief description of particle and field experiments. G.G.

N74-34270*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DATA CATALOG OF SATELLITE EXPERIMENTS. SUPPLEMENT 2C: ASTRONOMY AND SOLAR PHYSICS
Oct. 1974 27 p
(NASA-TM-X-72529; NSSDC-74-15C-Suppl-2C) Avail: NTIS HC $4.50 CSCL 22C

Each data set contained in this catalog lists spacecraft characteristics, experiment personnel, and a brief description of astronomy and solar physics experiments. G.G.

N74-34271*# TRW Systems, Redondo Beach, Calif.
MISSION REQUIREMENTS CSM-111/DM-2 APOLLO/SOYUZ TEST PROJECT
Stanley M. Blackmer 29 Jul. 1974 129 p refs
(Contract NAS9-13834)
(NASA-CR-140242; JSC-08819) Avail: NTIS HC $9.50 CSCL 22A

Test systems are developed for rendezvous and docking of manned spacecraft and stations that are suitable for use as a standard international system. This includes the rendezvous and docking of Apollo and Soyuz spacecraft, and crew transfer. The conduct of the mission will include: (1) testing of compatible rendezvous systems in orbit; (2) testing of universal docking assemblies; (3) verifying the techniques for transfer of cosmonauts and astronauts; (4) performing certain activities by U.S.A. and U.S.S.R. crews in joint flight; and (5) gaining of experience in conducting joint flights by U.S.A. and U.S.S.R. spacecraft, including, in case of necessity, rendering aid in emergency situations. Author

N74-34272*# Dudley Observatory, Albany, N.Y.
APOLLO DATA ANALYSIS EXPERIMENT S-211. LOW BRIGHTNESS IMAGE DATA ANALYSIS Final Report
Robert D. Mercer 31 Jan. 1974 72 p
(Contract NAS9-12557)
(NASA-CR-140276) Avail: NTIS HC $6.75 CSCL 22C

The scientific analyses of photographic data in astronomy obtained by the Apollo Orbital Science Photographic Team during Apollo flights 14 through 17 are described. Some of the tasks are the collection and correlation of Quick-Look listings, working prints for further study, the generation of post-mission reports, and project reports. Postflight calibrations of the flight photographic systems are carried out, and lens vignetting effects are corrected. The data handling is described and includes photodigitization of photographic scenes, calibrated step-wedges, and vignetting patterns, which are followed by computer program processing of the film density readings. Author

N74-34273*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CONTROL OPTIMIZATION OF A LIFTING BODY ENTRY PROBLEM BY AN IMPROVED AND A MODIFIED METHOD OF PERTURBATION FUNCTION Ph.D. Thesis - Houston Univ.
Frank Garcia, Jr. Sep. 1974 87 p refs
(NASA-TM-X-58151; JSC-09205) Avail: NTIS HC $4.00 CSCL 22C

A study of the solution problem of a complex entry optimization was studied. The problem was transformed into a two-point boundary value problem by using classical calculus of variation methods. Two perturbation methods were devised. These methods attempted to desensitize the contingency of the solution of this type of problem on the required initial co-state estimates. Also numerical results are presented for the optimal solution resulting from a number of different initial co-states estimates. The perturbation methods were compared. It is found that they are an improvement over existing methods. Author

N74-34274*# Martin Marietta Aerospace, Denver, Colo.
AN ORBITAL RADAR MAPPER OF VENUS IN THE 1980'S: MISSION DESIGN AND ANALYSIS
Scott K. Asnin 12 Sep. 1973 51 p refs Backup document for AIAA Synoptic, "Venus Orbital Radar Mapping in the 1980's: Mission Design and Analysis", scheduled for publication in Journal of Spacecraft and Rockets in Dec. 1974
(Contract NAS2-7204)
(NASA-CR-140029) Avail: NTIS HC $5.75 CSCL 03B

The examination of Venus topography, obscured for photographic imaging, is reported in the application of airborne radar mapping systems to an orbiter mission about the planet. Extrapolating the improving capabilities of earth-based radar study of Venus into the 1980's is reported which suggests that only a non-uniform, poorly resolved surface profile will be possible relative to the potential for 100% coverage at 100 meter resolution with an orbital radar. The intent of this paper is: to define mission opportunities favorable for a Venus orbital mapper during the 1980's, to examine orbit design problems associated with mapping radar systems, to establish with flexibility exists for an adaptive mapping strategy, to contribute to the sizing of particular spacecraft systems, and to suggest a reference mission design and demonstrate feasibility. Author

N74-34275*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB KOHOUTEK EXPERIMENTS MISSION EVALUATION
Sep. 1974 49 p refs
(NASA-TM-X-64879) Avail: NTIS HC $3.25 CSCL 22C

The Comet Kohoutek was documented by the Skylab 4 experiments' observations. The experiment concepts, hardware, operational performance and anomalies are discussed. Experiments which viewed the comet were mainly through the SAL and ATM, but some were handheld and EVA. Author

N74-34276*# Kanner (Leo) Associates, Redwood City, Calif.
OAZIS IN SPACE
Aleksandr Kamin Washington NASA Sep. 1974 9 p Transl. into ENGLISH of "Oazis v Kosmose" in Tekhn. Molodezhi (USSR), no. 4, 1974 p 13
(Contract NASw-2481)
(NASA-TT-F-15986) Avail: NTIS HC $4.00 CSCL 22C

One form of possible food production in a closed-cycle environment such as a spaceflight, the Oazis unit is described. The initial Oazis experiment, a unit launched on board the Cosmos 268 satellite, used hydrogen and urobacteria in two cylindrical containers with the electrolysis of water as the energy source. Oazis-2 was basically the same, but had a different energy supply system. After functioning 12 hours in space on Soyuz 13, the bacteria multiplied 30 times, much more than in trial experiments on earth. Author

N74-34277*# Lunar Science Inst., Houston, Tex.
LUNAR INTERACTIONS: ABSTRACTS OF PAPERS PRESENTED AT THE CONFERENCE ON INTERACTIONS OF THE INTERPLANETARY PLASMA WITH THE MODERN AND ANCIENT MOON
David R. Criswell, ed. and John W. Freeman, ed. 1974 150 p refs Conf. held at Williams Bay, Wis., 30 Sep. - 4 Oct. 1974 Sponsored in part by NSF
(Contract NSR-09-051-001)
(NASA-CR-140397) Avail: NTIS HC $10.50 CSCL 03B

Reviewed are the active mechanisms relating the moon to its environment and the linkage between these mechanisms and their records in the lunar sample and geophysical data. Topics: (1) large scale plasma interactions with the moon and non-magnetic planets; (2) ancient and present day lunar surface magnetic and electric fields; (3) dynamics and evolution of the lunar atmosphere; (4) evolution of the solar plasma; (5) lunar record of solar radiations; (6) non-meteoritic and meteoritic disturbance and transport of lunar surface materials; and (7) future lunar exploration. Author

N74-34278*# Linguistic Systems, Inc., Cambridge, Mass.
HYDRODYNAMIC MODELS OF THE FLOW AROUND PLANETS HAVING A MAGNETIC FIELD, AND THE FEASIBILITY OF ESTIMATING PARAMETERS OF THE MAGNETOSPHERE OF JUPITER
K. V. Krasnobayev Washington NASA Aug. 1974 36 p refs Transl. into ENGLISH of "Gidrodinamicheskiye Modeli Obtekaniya Planet, Imeyushchikh Magnitnoe Pole, i Vozmozhnost Otsenki Parametrov Magnitosfery Yupitera" Inst. of Space Res., Acad. of Sci. USSR, Moscow, report Pr-158, 1974 35 p
(Contract NASw-2482)
(NASA-TT-F-15673; Pr-158) Avail: NTIS HC $5.00 CSCL 03B

Hydrodynamic models of the flow to the solar wind past planets having a magnetic field are analyzed. The results of analysis indicate that for calculation of the magnetospheric structure on the daytime side, knowledge of only the properties of the free stream flow is sufficient. At the same time, the shape and location of the magnetopause, and likewise the distribution to the magnetic field in the tail, can only be determined if, in addition, the parameters of the current sheath are konwn. The values of the concentration, velocity, and temperature of the solar wind plasma necessary for the calculation of the shape of Jupiter's magnetosphere can be taken from the corresponding single fluid model, since the influence of the interstellar medium and of gravitational field of the planet on the flow is probably small. For certain boundary conditions, the hydrodynamic models can be employed to study the interaction of the solar wind with Jupiter. Author

N74-34279*# Techtran Corp., Glen Burnie, Md.
MARS-3: WATER VAPOR IN THE PLANETARY ATMOSPHERE 1974
V. R. Moroz and A. E. Nadzhip Washington NASA Sep. 1974 25 p refs Transl. into ENGLISH of "Mars-3: Vodyanoy par v Atmosfere Planety", Inst. of Space Res., Acad. of Sci. U.S.S.R. Moscow, Report Pr-174, 1974 36 p
(Contract NASw-2485)
(NASA-TT-F-15913; Pr-174) Avail: NTIS HC $4.25 CSCL 03B

The results of ground-based and Mars 3 spectroscopic measurements of H2O content in the atmosphere of Mars are reported. Results show that the water content is very low; it consists on the average of 20 to 30 microns of precipitated water. The total quantity of water does not exceed several cubic kilometers. The water content changes with time and is different in different areas; it reaches a maximum of 60 microns, but sometimes it decreases to 10 microns and below. G.G.

N74-34280*# California Univ., Berkeley. Space Sciences Lab.
LUNAR SOIL PROPERTIES AND SOIL MECHANICS Final Report, 20 Jun. 1970 - 30 Sep. 1973
James K. Mitchell and William N. Houston Jun. 1974 61 p refs
(Grant NGR-05-003-406)
(NASA-CR-140117; SSL-Ser-15-Issue-36) Avail: NTIS HC $6.25 CSCL 03B

The long-range objectives were to develop methods of experimentation and analysis for the determination of the physical properties and engineering behavior of lunar surface materials under in situ environmental conditions. Data for this purpose were obtained from on-site manned investigations, orbiting and softlanded spacecraft, and terrestrial simulation studies. Knowledge of lunar surface material properties are reported for the development of models for several types of lunar studies and for the investigation of lunar processes. The results have direct engineering application for manned missions to the moon. Author

N74-34281*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SEISMIC EFFECTS FROM MAJOR BASIN FORMATION ON THE MOON AND MERCURY
Peter H. Schultz and Donald E. Gault Sep. 1974 41 p refs
(NASA-TM-X-62388) Avail: NTIS HC 3.25 CSCL 03B

Grooved and hilly terrains are reported which occur at the antipode of major basins on the Moon (Imbrium, Orientale) and Mercury (Caloris). Order-of-magnitude calculations, for an Imbrium-size impact on the Moon, indicate P-wave-induced surface displacements of 10 m at the basin antipode that would arrive prior to secondary ejecta. Comparable surface waves are reported which would arrive subsequent to secondary ejecta impacts and would increase in magnitude as they converge at the antipode. Other seismically induced surface features include: subdued, furrowed crater walls produced by landslides and concomitant secondary impacts; emplacement and leveling of light plains units owing to seismically induced 'fluidization' of slide material; knobby, pitted terrain around old basins from enhancement of seismic waves in ancient ejecta blankets; and the production and enhancement of deep-seated fractures that led to the concentration of farside lunar maria in the Apollo-Ingenii region. Author

N74-34282*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PRELIMINARY FEASIBILITY STUDY OF A MULTI-PHOBOS ENCOUNTER EXPERIMENT DURING THE VIKING EXTENDED MISSION
Robert H. Tolson, Robert C. Blanchard, and Edward F. Daniels Sep. 1974 30 p refs
(NASA-TM-X-72004) Avail: NTIS HC $3.25 CSCL 22A

The Viking '75 Mission to Mars is reported which permits a truly unique opportunity to explore the natural satellite, Phobos, from distances measured in tens of kilometers. A preliminary feasibility study has been made which shows that a science mission involving a Phobos close encounter is technically feasible and within the capabilities of the current Viking design. For less than 20 m/s, the Viking Orbiter can provide approximately two 40-day periods of close observation of Phobos, with the first encounter period in January and the second in March, 1977. Multi-pass images of the entire satellite from nearly all aspect angles and with resolution on the order of 10 meters are possible. Close encounters will permit mass determinations to an accuracy of tens of percent. These experiments can be performed in series with the nominal mission; thus, providing complementary scientific information without compromising the original mission and science objectives. Author

N74-34283*# Arizona Univ., Tucson. Lunar and Planetary Lab.
OBSERVATIONS OF COMET KOHOUTEK (1973f) Final Report
Stephen Larson 9 Oct. 1974 28 p refs
(Grant NGR-03-002-393)
(NASA-CR-140396) Avail: NTIS HC $4.50 CSCL 03B

The coma region Comet Kohoutek (1973f) was observed with a 40-mm proximity focused image intensifier tube and filters to isolate principal emissions. The low brightness of the comet limited the results, but it was possible to compare the intensity profiles of C2 and continuum in the coma. It appears that Comet Kohoutek was a typical comet in that it did not exhibit unusual coma structure similar to that of Comet Bennet. Photographs taken with the 42 cm Schmidt showed typical type 1, type, 2 and antitail morphology, with increased type 2 activity after perihelion passage. A technique for eliminating the

type 2 (dust) component of the tail is given by means of photographic subtraction of blue and red sensitive layers of a color photograph. Author

N74-34284*# Texas A&M Univ., College Station. Dept. of Physics.
HIGH-DISPERSION SPECTROSCOPIC OBSERVATIONS OF VENUS DURING 1968 AND 1969 II. THE CARBON-DIOXIDE BAND AT 8689A
R. A. J. Schorn, A. Woszczyk (Nicolaus Copernicus Univ.), and L. D. Gray Young 28 Jun. 1974 26 p refs Submitted for publication
(Contract NGR-44-001-117)
(NASA-CR-140399; Rept-10) Avail: NTIS HC $4.50 CSCL 03A

Thirty well-exposed photographic plates showing the spectrum of the carbon dioxide band at 8689A in the atmosphere of Venus were obtained during 1968 and 1969. All spectra were obtained at a dispersion of 2 A/mm for Venus phase angles varying from 10 deg. to 126 deg. Rotational temperatures ranging from 236 K to 274 K were found. The average value of the rotational temperature is 246 + or - 1 K (one standard deviation); for 1967 observations, the rotational temperatures ranged from 222 to 248 K, with an average value of 238 + or - 4 K. The variation of the equivalent width of the 8689A band, with Venus phase angle, was very similar for the two sets of observations (53 plates). The temporal variations, of approximately 30 percent, were comparable with the phase variations over this limited range of phase angle. Author

N74-34285*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON A SUSPECTED RING EXTERNAL TO THE VISIBLE RINGS OF SATURN
Walter A. Feibelman, Reta F. Beebe (New Mexico State Univ., Las Cruces), Bradford A. Smith (New Mexico State Univ., Las Cruces), and Allan F. Cook, II (Smithsonian Astrophysical Observatory) Sep. 1974 11 p refs Submitted for publication
(NASA-TM-X-70756; X-673-74-261) Avail: NTIS HC $4.00 CSCL 03B

The reexamination of a photograph of Saturn taken on 15 November 1966 when the earth was nearly in the ring plane is investigated which indicates that ring material does exist outside the visible rings, extending to more than 6 Saturnian radii. The observed brightness in blue light was estimated per linear arc second, implying a normal optical thickness, for ice-covered particles. Author

N74-34286# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SEMIEMPIRICAL CALCULATION OF gf VALUES. 3: INTERSTELLAR LINES OF THE IRON GROUP
Robert L. Kurucz 15 Apr. 1974 60 p refs
(SAO-Special-Rept-360; SAO-405-041) Avail: NTIS HC $6.00

Iron group gf values are tabulated for lines that might appear in the interstellar medium. Author

N74-34287*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE VIKING MISSION TO MARS
Washington 1974 82 p refs Original contains color illustrations
(NASA-SP-334) Avail: NTIS MF $2.25; SOD HC $1.20 CSCL 22A

This monograph describes the National Aeronautics and Space Administration's program to explore the planet that most nearly resembles the earth and the search for life on the surface of Mars that the Vikings are scheduled to begin in 1976. Author

N74-34288# Lockheed Missiles and Space Co., Palo Alto, Calif.
HYDROMAGNETIC WAVE PROPAGATION IN A THREE DIMENSIONAL MAGNETOSPHERE, 1
L. L. Vanian and A. S. Lipatov [1974] 7 p refs Transl. into ENGLISH from Geomagn. Aeron (USSR), v. 14, no. 3, 1974 p 496-501
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A three dimensional problem about small oscillations of a cold magnetospheric plasma during interaction with large scale inhomogeneities in the solar wind is solved numerically in the magnetohydrodynamic approximation. The initial geomagnetic field and magnetosphere geometry are selected on the basis of the research of Mead and Beard. The solar wind pressure on the magnetopause is approximated by Newton's law. Author

N74-34289*# Texas Technological Univ., Lubbock. Dept. of Mathematics.
A STUDY TO DETERMINE THE USEFULNESS OF INTERVAL ANALYSIS IN SOLVING PROBLEMS IN CELESTIAL MECHANICS Final Report
Derald Walling 1974 4 p refs
(Grant NGR-44-011-020)
(NASA-CR-140426) Avail: NTIS HC $4.00 CSCL 03C

This investigation was undertaken to determine the usefulness of interval analysis to numerical integration and matrix inversion techniques and to combine these results to determine the value of interval analysis in bounding computational errors in the two-body problem. Conclusions were that interval analysis may be worthwhile in certain small scale isolated problems, but its usefulness in any large scale problem is doubtful. Author

N74-34290*# Boeing Aerospace Co., Houston, Tex.
DYNAMIC DOCKING TEST SYSTEM (DDTS) ACTIVE TABLE COMPUTER PROGRAM NASA ADVANCED DOCKING SYSTEM (NADS)
R. M. Gates and R. E. Jantz 30 Aug. 1974 136 p ref
(Contract NAS9-13136)
(NASA-CR-140287; D2-118544-2) Avail: NTIS HC $10.00 CSCL 22A

A computer program was developed to describe the three-dimensional motion of the Dynamic Docking Test System active table. The input consists of inertia and geometry data, actuator structural data, forcing function data, hydraulics data, servo electronics data, and integration control data. The output consists of table responses, actuator bending responses, and actuator responses. Author

N74-34291*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
COORDINATE SYSTEMS FOR THE SPACE SHUTTLE PROGRAM
Larry D. Davis Oct. 1974 54 p Supersedes NASA-IN-74-FM-51
(NASA-TM-X-58153; JSC-09084; NASA-IN-74-FM-51) Avail: NTIS HC $3.75 CSCL 22A

A minimal set of well defined coordinate systems necessary for the interchange of data within the space shuttle program is presented. The document format consists of four parts: (1) a list of the subscripts identifying the coordinate systems, (2) a glossary explaning the terms used within the coordinate system definitions, (3) figures defining, both graphically and verbally, each coordinate system, and (4) an appendix (published separately) showing the relationships (transformations) between similar systems. Author

N74-34292*# Kanner (Leo) Associates, Redwood City, Calif.
VOLCANISM AND TECTONICS OF THE MOON
A. L. Sukhanov and V. G. Trifonov Washington NASA Oct. 1974 286 p refs Transl. into ENGLISH of the book "Vulkanizm i Tektonika Luny" Moscow, Nauka Press, 1974 251 p
(Contract NASw-2481)
(NASA-TT-F-15847) Avail: NTIS HC $17.50 CSCL 03B

A map is presented of lunar volcanic features based on methods of photogeology. Domes, central volcanoes, dikes, volcanic ridges, areal effusions, volcanic regions and craters of volcanic origin are widespread on the moon. Volcanogenic craters are recognized by their structure, distribution, and nature of their walls. Different varieties of volcanogenic craters are classified and compared with meteorite craters. Distribution analysis shows that 33.5% to 50% of the lunar surface is composed of volcanogenic craters and areal effusion and volcanic regions. Differences between terrestrial and lunar volcanic craters are discussed and explained. A map of lunar mare basins represents the nature and time scale of their formation; the basins were formed side by side with their filling by mare material.

Magma generation and routes for its dispersal are indicated. Evidence of endogenous history help explain the moon's interior. Author

N74-34293*# Scientific Translation Service, Santa Barbara, Calif.
PHYSICAL CHARACTERISTICS OF COMETS, 1965 - 1970
S. K. Vsekhsvyatskiy and N. I. Ilchishina Washington NASA Oct. 1974 118 p refs Transl. into ENGLISH of the book "Fizicheskiye Karakteristiki Komet 1965-1970" Moscow, Nauka Press, 1974 p 1-112
(Contract NASw-2483)
(NASA-TT-F-15758) Avail: NTIS HC $9.00 CSCL 03B

The orbital elements, descriptions, and information about observations of all comets which have appeared from 1965 to 1970 are presented. Detailed citations to the original sources are given. Author

N74-34294*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
DYNAMICAL AND PHOTOMETRIC INVESTIGATION OF COMETARY TYPE 2 TAILS Semiannual Progress Report, 15 Mar. - 14 Sep. 1974
Zdenek Sekanina 14 Sep. 1974 36 p refs
(Grant NGR-09-015-159)
(NASA-CR-140445; SAPR-6) Avail: NTIS HC $5.00 CSCL 03A

Photographic observations of the antitail of Comet Kohoutek (1973f) are photometrically studied and the results compared with the working model of an antitail. The applied technique of photometric reduction is described and the radial and transverse profiles of the antitail, corrected for the effects of the variable intensity of the sky background, are derived. The most important result reached so far is a quantitative confirmation of the previously suggested hypothesis, arguing that dust particles in the antitail suffered a significant loss in radius due to evaporation near the perihelion passage. Only particles initially larger than 0.1 to 0.15 mm in diameter survived. Numerically, however, this result is still tentative, because the dynamical effect exerted by particle evaporation remains to be accounted for. Author

N74-34295*# Pittsburgh Univ., Pa. Dept. of Physics.
OUTER PLANETS GRAND TOUR ULTRAVIOLET SPECTROSCOPY EXPERIMENT Final Report
T. M. Donahue 30 Sep. 1974 27 p
(Grant NGR-39-011-134)
(NASA-CR-140436) Avail: NTIS HC $4.50 CSCL 22A

The principal objective is presented of the UV observations, with emphasis placed on hydrogen and helium. Calculations are given for airglow and occultation. Mission requirements and trajectories are also reported for future observations. M.C.F.

N74-34296*# Computer Sciences Corp., Wallops Island, Va.
HYBRID 3-D ROCKET TRAJECTORY PROGRAM. PART 1: FORMULATION AND ANALYSIS. PART 2: COMPUTER PROGRAMMING AND USER'S INSTRUCTION
Louis C. P. Huang and Ronald A. Cook 1973 112 p
(Contract NAS6-2369)
(NASA-CR-137472) Avail: NTIS HC $8.75 CSCL 22C

Models utilizing various sub-sets of the six degrees of freedom are used in trajectory simulation. A 3-D model with only linear degrees of freedom is especially attractive, since the coefficients for the angular degrees of freedom are the most difficult to determine and the angular equations are the most time consuming for the computer to evaluate. A computer program is developed that uses three separate subsections to predict trajectories. A launch rail subsection is used until the rocket has left its launcher. The program then switches to a special 3-D section which computes motions in two linear and one angular degrees of freedom. When the rocket trims out, the program switches to the standard, three linear degrees of freedom model. Author

N74-34297# Catania Univ. (Italy). Ist. di Fisica Teorica.
ASTROPHYSICS AND TACHYONS
R. Mignani and E. Recami Oct. 1973 32 p refs
(NP-19895) Avail: AEC Depository Libraries HC $3.75

From the very special relativity theory, existence of superluminal reference frames and faster-than-light-objects can be inferred, when its validity is not arbitrarily confined to subluminal velocities. Recently, special relativity was extended to superluminal inertial frames and to tachyons thus allowing a sound, self-consistent development of a classical theory of tachyons. The extended theory of relativity allows extending the Doppler effect formulas to superluminal sources. The possibilities of radiocontact between subluminal and superluminal objects are as well considered. The behavior of tachyonic bodies in the gravitational field was clarified. Tachyons are predicted to suffer a gravitational repulsion (so to be considered as the antigravitational matter); however, owing to their dynamics, they happen finally to behave-from the geometrical and kinematical viewpoint-as usual objects do. Author (NSA)

N74-34298# Catania Univ. (Italy). Ist. di Fisica Teorica.
CLASSICAL THEORY OF TACHYONS (SPECIAL RELATIVITY EXTENDED TO SUPERLUMINAL FRAMES AND OBJECTS)
R. Mignani and E. Recami Jul. 1973 175 p refs
(NP-19899) Avail: AEC Depository Libraries HC $10.75

The classical theory of superluminal objects, where classical means relativistic but not quantum mechanical is reviewed. The generalization of special relativity to superluminal (inertial) reference frames and tachyons, causal paradoxes, symmetries required by extended relativity for example the crossing relations derived for usual particle scattering are treated. A close link between magnetic monopoles and tachyons is suggested. NSA

N74-34299# Institut Royal Meteorologique de Belgique, Brussels.
SOME REMARKS ABOUT THE TEMPERATURE EFFECT ON MESON TELESCOPE DATA
A. VanGysegen 1974 15 p refs
(Publ-Ser-B-75) Avail: NTIS HC $4.00

The influence of earth level atmospheric temperature and pressure on the intensity of meson telescope data was calculated, investigations were also made of the effects of pions, kaons, and muons from decaying pions or kaons on atmospheric effects. A method used to correct radiation errors and the effects of such correction on radiosonde data was examined. ESRO

N74-34300# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
OPTICAL PROPERTIES OF THE LOWER VENUS ATMOSPHERE (TO THE INTERPRETATION OF AIS VENERA-8 MEASUREMENTS)
L. G. Titarchuk 18 Apr. 1973 11 p refs
(PR-139) Avail: NTIS HC $4.00

The physical and optical properties of Venus' atmosphere as seen by Venera 8 during downfall are discussed. The dependence of the downfalling light flux on the altitude shows, after least squares curves fittings, two layers of strongly different properties. From ground to 28 km altitude, the conservative Rayleigh scattering takes place. From 28 km to 65 km, the absorption and scattering of visible light are almost conservative. This layer has a considerable optical depth. The upper region of this cloudy layer, above 44 km, is more transparent than the lower one. The whole cloudy layer is more transparent for the 6300 to 8000 angstrom band than for the shorter 5000 to 63000 angstrom band. ESRO

N74-34301# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
ON ABSORPTION IN THE DIRECTION OF W51
V. I. Slysh 25 Jul. 1973 34 p refs
(PR-143) Avail: NTIS HC $4.75

The 18-cm OH absorption measurements in the direction of thermal source complex W51 are presented with a beam width 3.4x18. Analysis of the absorbing matter spatial distribution reveals that there are 2 types of clouds. Type 1 clouds are not connected physically to the thermal source; their large linear dimension and low density are typical of interstellar medium. The size and density of type 2 clouds are similar to those of Helies dust clouds. These compact clouds contain the thermal radio sources; microwave radiation of the sources increase excitation temperature of 18-cm OH transition. Three type 2 clouds were found in W51 complex; their radial velocities 51, 56, and 69 km/s are close to the radial velocities of the thermal sources and of CO molecular millimeter wave length emission sources. Author (ESRO)

N74-34302# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
REFLECTION AND REPROCESSING OF THE X-RAY SOURCE RADIATION BY THE ATMOSPHERE OF THE NORMAL STAR IN BINARY SYSTEMS
M. M. Basko, R. A. Sunyaev, and L. G. Titarchuk 23 May 1973 45 p refs
(PR-146) Avail: NTIS HC $5.25

The X-ray transfer in a semi-infinite plane atmosphere irradiated with the flux of hard X-rays is numerically treated. Photoabsorption and Compton scattering are taken into account. The values of albedo and the spectral, polarizational, spatial, and temporal characteristics of the reflected X-rays are found. Results, in connection with the particular systems Her X 1 and Cyg X 3 are discussed. It is pointed out that there may exist X-ray sources which are weak in the range of energies around 2.6 keV and bright around 15.20 keV. It is possible that Her X 1 is just such a source during those 24 out ot 36 days, when the beam of the X-ray pulsar does not cover the earth and only the reflected Hz Her surface X-ray flux may be detected. It is noted also that the reprocessing of the soft X-rays in the atmosphere of Hz Her cannot account for its optical variability. However, the variability can be easily explained by the reprocessing of hard X-rays. The optical pulsations of Hz Her are also discussed. Author (ESRO)

N74-34303# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
RESULTS OF RADAR EXPERIMENTS PERFORMED ON-BOARD THE 'LUNA-19, 20' AUTOMATIC STATIONS
N. N. Kroupenio, A. G. Balo, E. G. Ruzskii, V. A. Ladyghin, V. V. Cherkasov, and V. S. Fomin 5 Mar. 1974 15 p refs
(PR-171) Avail: NTIS HC $4.00

The Luna 19 and Luna 20 automatic stations measured the radiowave reflection characteristics in the 3 cm wavelength range during orbital flight and descent. Procedures used for data processing are outlined, and data pertinent to the specific radar cross section for normal incidence, power reflection coefficient, and dielectric constant are given. From these the soil density, porosity coefficients, porosity and rms angles of the surface inclination (base 30 cm) are derived for the two landing sites: Rumker crater (Luna 19) and Mare Foecunditatis (Luna 20).
ESRO

N74-34304# Mons Univ. (Belgium). Dept. d'Astrophysique.
THE 1970, ECLIPTIC COORDINATES OF STARS FROM THE STAR CATALOG OF THE SMITHSONIAN ASTROPHYSICAL OBSERVATORY [COORDONNEES ECLIPTIQUES 1970,O DES ETOILES DU STAR CATALOG DU SMITHSONIAN ASTROPHYSICAL OBSERVATORY]
L. Houziaux and F. Ostan 1973 7 p refs In FRENCH
(Commun-28) Avail: NTIS HC $4.00

The 258.997 stars of the Smithsonian Astrophysical Observatory 1966 Star Catalog were renumbered according to increasing ecliptic longitude. The new catalog is available from the author as computer listing or on magnetic tapes. ESRO

N74-34305# Mons Univ. (Belgium). Dept. d'Astrophysique.
TEMPERATURE DETERMINATION OF B7-B8 TYPE STARS BY MEANS OF LOW DISPERSION ULTRAVIOLET OBSERVATIONS
L. Houziaux 1974 10 p refs
(Commun-39) Avail: NTIS HC $4.00

Temperatures obtained for 29 B7-B8 stars, using low dispersion ultraviolet spectroscopy, are listed. Instrumental effects, calibration, and interstellar absorption effects are discussed.
ESRO

N74-34306# Osservatorio Astronomico, Rome (Italy).
A NUMERICAL METHOD FOR THE ANALYSIS OF STELLAR SPECTRA
A. Cassatella, G. A. Debiase, and P. Persi Nov. 1973 10 p refs Presented at the 59th Congr. Nazl. della Soc. Ital. di Fis.
(RR-13) Avail: NTIS HC $4.00

The observed high dispersion spectrum is fitted by a system of lines with known profiles. The line parameters are derived by an iterative procedure using the least squares method. The performance of the method was tested by analyzing a small portion 4017 to 4027 A of a blue spectrum of delta Tau. It is shown that the method is suitable for the spectral line identification and for the blended line resolution. ESRO

N74-34307# Groupe de Recherches de Geodesie Spatiale, Paris (France).
ASTROMETRICAL APPLICATIONS OF LONG BASELINE INTERFEROMETRY
H. G. Walter (European Space Operations Centre) Aug. 1973 40 p refs Sponsored by ESRO
(GRGS-Bull-10) Avail: NTIS HC $5.00

The parameters pertinent to long baseline interferometric radio astronomy are reviewed. The fringe frequency and phase, time delays, relative sensitivity to inaccuracies of the astronomical constants such as luni solar precession, mutation constant, obliquity variations, and geophysical parameters such as pole movement and earth rotation are discussed. The obervational partial derivatives in respect of these quantities are the core of the estimation procedure and produce evidence of the influence of radio source position and baseline geometry. A variance--covariance analysis allows for the determination of the correlation coefficients between the unknowns. Results show that the observations are sensitive to astronomical constant variations and geophysical parameters. Furthermore, these variations are measurable and separable if the observations are performed during a long enough time and if the radio sources and baseline positions are suitably chosen. ESRO

N74-34308# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRONS AT LOW ALTITUDES: A. DIFFICULT BACKGROUND PROBLEM FOR SOFT X-RAY ASTRONOMY
F. D. Seward, R. J. Grader, A. Toor, G. A. Burginyon, and R. W. Hill 24 Oct. 1973 31 p refs
(Contract W-7405-eng-48)
(UCRL-51470) Avail: NTIS HC $4.00

Quasi-trapped and precipitating electrons have been observed with rocket-borne X-ray astronomy detectors in the altitude range 150 to 500 km. Because the flights occurred at low magnetic latitudes the electrons were unexpected. Data from many flights are combined to derive altitude dependence, an average electron spectrum, and variation with solar activity. Development of electron rejecting collimators is discussed, and laboratory and flight data on these collimators are presented. Author (NSA)

N74-34309# Army Foreign Science and Technology Center, Charlottesville, Va. Transl. into ENGLISH from Geod. i Kartografiya (USSR), no. 4, 1973 p 23-26
TECHNIQUE FOR COMBINED DETERMINATION OF ASTRONOMICAL COORDINATES OF A POINT AND THE AZIMUTH OF ORIENTING DIRECTION
V. I. Volkov 19 Apr. 1974 9 p refs
(AD-781930; FSTC-HT-23-274-74) Avail: NTIS CSCL 03/1

In the interest of shortening observation time, the author proposes a technique of combined determination of the astronomical latitude and longitude and of the azimuth of the orienting direction on the basis of observations of a minimum quantity of northern and southern stars in the meridian of the place of observation. GRA

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also; 28 Propulsion Systems; and 32 Structural Mechanics.

N74-34310*# General Dynamics/Convair, San Diego, Calif.
LIFE SCIENCES PAYLOAD DEFINITION AND INTEGRATION STUDY. VOLUME 1: EXECUTIVE SUMMARY
Aug. 1974 53 p 4 Vol.
(Contract NAS8-30288)
(NASA-CR-120451; CASD-NAS-74-046-Vol-1) Avail: NTIS HC $5.75 CSCL 22A

The definition and integration tasks involved in the development of design concepts for a carry-on laboratory (COL), to be compatible with Spacelab operations, were divided into the following study areas: (1) identification of research and equipment requirements of the COL; (2) development of a number of conceptual layouts for COL based on the defined research of final conceptual designs; and (4) development of COL planning information for definition of COL/Spacelab interface data, cost data, and program cost schedules, including design drawings of a selected COL to permit fabrication of a functional breadboard. Author

N74-34311*# General Dynamics/Convair, San Diego, Calif.
LIFE SCIENCES PAYLOAD DEFINITION AND INTEGRATION STUDY. VOLUME 2: REQUIREMENTS, DESIGN, AND PLANNING STUDIES FOR THE CARRY-ON LABORATORIES
Aug. 1974 168 p refs 4 Vol.
(Contract NAS8-30288)
(NASA-CR-120452; CASD-NAS-74-046-Vol-2) Avail: NTIS HC $11.50 CSCL 22A

The task phase concerned with the requirements, design, and planning studies for the carry-on laboratory (COL) began with a definition of biomedical research areas and candidate research equipment, and then went on to develop conceptual layouts for COL which were each evaluated in order to arrive at a final conceptual design. Each step in this design/evaluation process concerned itself with man/systems integration research and hardware, and life support and protective systems research and equipment selection. COL integration studies were also conducted and include attention to electrical power and data management requirements, operational considerations, and shuttle/Spacelab interface specifications. A COL program schedule was compiled, and a cost analysis was finalized which takes into account work breakdown, annual funding, and cost reduction guidelines. A.A.D.

N74-34312*# General Dynamics/Convair, San Diego, Calif.
LIFE SCIENCES PAYLOAD DEFINITION AND INTEGRATION STUDY. VOLUME 3: PRELIMINARY EQUIPMENT ITEM SPECIFICATION CATALOG FOR THE CARRY-ON LABORATORIES
Aug. 1974 159 p 4 Vol.
(Contract NAS8-30288)
(NASA-CR-120453; CASD-NAS-74-046-Vol-3) Avail: NTIS HC $11.00 CSCL 22A

All general purpose equipment items contained in the final carry-on laboratory (COL) design concepts are described in terms of specific requirements identified for COL use, hardware status, and technical parameters such as weight, volume, power, range, and precision. Estimated costs for each item are given, along with projected development times. A.A.D.

N74-34313*# General Dynamics/Convair, San Diego, Calif.
LIFE SCIENCES PAYLOAD DEFINITION AND INTEGRATION STUDY. VOLUME 4: APPENDIX, COSTS, AND DATA MANAGEMENT REQUIREMENTS OF THE DEDICATED 30-DAY LABORATORY
Aug. 1974 92 p refs 4 Vol.
(Contract NAS8-30288)
(NASA-CR-120454; CASD-NAS-74-046-Vol-4) Avail: NTIS HC $7.75 CSCL 22A

The results of the updated 30-day life sciences dedicated laboratory scheduling and costing activities are documented, and the 'low cost' methodology used to establish individual equipment item costs is explained in terms of its allowances for equipment that is commerical off-the-shelf, modified commercial, and laboratory prototype; a method which significantly lowers program costs. The costs generated include estimates for non-recurring development, recurring production, and recurring operations costs. A cost for a biomedical emphasis laboratory and a Delta cost to provide a bioscience and technology laboratory were also generated. All cost reported are commensurate with the design and schedule definitions available. Author

N74-34314*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF INVESTIGATIONS ON AN 0.015 SCALE 140A/B CONFIGURATION SPACE SHUTTLE VEHICLE ORBITER MODEL (49-0) IN THE LTV 4 BY 4-FOOT HIGH SPEED WIND TUNNEL (0A84)
V. Esparza and W. R. Embury Aug. 1974 881 p refs Prepared in cooperation with Rockwell Intern. Corp., Downey, Calif.
(Contract NAS9-13247)
(NASA-CR-134405; DMS-DR-2037) Avail: NTIS HC $47.25 CSCL 22B

Data obtained from a wind tunnel test of an 0.015-scale 140 A/B configuration space shuttle vehicle orbiter model (49-0) are presented. Runs were conducted at Mach numbers 0.6, 0.9, 1.2, 1.6, and 2.0 and Reynolds numbers of 8.4, 9.0, 9.0, 10.9, and 13.6 million per foot respectively. Various control surface settings were investigated from angles of attack of minus 4 degrees to plus 30 degrees at fixed angles of sideslip of zero and minus 5 degrees and through angles of sideslip from minus 2 to plus 8 degrees at fixed angles of attack of zero, plus 10, plus 15, and plus 20 degrees. The purpose of the test was to define the longitudinal and lateral-directional stability and control characteristics for the updated SSV configuration. Author

N74-34315*# Chrysler Corp., New Orleans, La.
AERODYNAMIC RESULTS OF A SUPPORT SYSTEM INTERFERENCE EFFECTS TEST CONDUCTED AT NASA/LaRC UPWT USING AN 0.015-SCALE MODEL OF THE CONFIGURATION 140A/B SSV ORBITER (0A20B)
J. H. Campbell, II and W. R. Embury [1974] 390 p
(Contract NAS9-13247)
(NASA-CR-134403; DMS-DR-2163) Avail: NTIS HC $22.50 CSCL 22B

An experimental aerodynamic investigation was conducted to determine the interference effects of a wind tunnel support system. The test article was a 0.015 scale model of the space shuttle orbiter. The primary objective of the test was to determine the extent that aerodynamic simulation of the space shuttle orbiter is affected by base mounting the model, without nozzles, on a straight sting. Two support systems were tested. The characteristics of the support systems are described. Data from the tests are presented in the form of graphs and tables. Author

N74-34316*# General Dynamics/Convair, San Diego, Calif. Aerospace Div.
DESIGN, MANUFACTURE, DEVELOPMENT, TEST, AND EVALUATION OF BORON/ALUMINUM STRUCTURAL COMPONENTS FOR SPACE SHUTTLE. VOLUME 4: REPAIRABILITY Final Report
M. F. Miller, J. L. Christian, and F. H. Doyal Aug. 1974 39 p refs
(Contract NAS8-27738)
(NASA-CR-120465; GDCA-DBG73-006-Vol-4) Avail: NTIS HC $5.00 CSCL 22B

The repairability of boron/aluminum structural components was investigated. It was demonstrated that metal matrix composite material, damaged in service, can be repaired by techniques that are not very different from those currently in use for conventional materials. A list of repair guidelines was prepared to aid in determining the proper repair techniques for a given structure. The guidelines include specifying types of repair material and their applicability, corrosion prevention procedures, design criteria, and inspection criteria. Boron/aluminum structural components were repaired and tested to compare as-fabricated and repaired performance. All but one set of specimens, when repaired, exceeded the strength of the original specimens. Author

N74-34317*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: A USE OF NETWORK SIMULATION TECHNIQUES IN THE DESIGN OF THE APOLLO LUNAR SURFACE EXPERIMENTS PACKAGE SUPPORT SYSTEM
Richard A. Gustafson and Jeffrey N. Wilkes Washington Sep. 1974 13 p
(NASA-TN-D-7783; JSC-S-404) Avail: NTIS HC $3.00 CSCL 17B

A case study of data-communications network modeling and simulation is presented. The applicability of simulation techniques in early system design phases is demonstrated, and the ease with which model parameters can be changed and comprehensive

statistics gathered is shown. The discussion of the model design and application also yields an insight into the design and implementation of the Apollo lunar surface experiments package ground-support system. Author

N74-34318*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: APOLLO LUNAR SURFACE EXPERIMENTS PACKAGE DATA PROCESSING SYSTEM
Roy L. Eason Washington Sep. 1974 15 p
(NASA-TN-D-7781; JSC-S-402) Avail: NTIS HC $3.00 CSCL 09B

Apollo Program experience in the processing of scientific data from the Apollo lunar surface experiments package, in which computers and associated hardware and software were used, is summarized. The facility developed for the preprocessing of the lunar science data is described, as are several computer facilities and programs used by the Principal Investigators. The handling, processing, and analyzing of lunar science data and the interface with the Principal Investigators are discussed. Pertinent problems that arose in the development of the data processing schemes are discussed so that future programs may benefit from the solutions to the problems. The evolution of the data processing techniques for lunar science data related to recommendations for future programs of this type. Author

N74-34319*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF TESTS IN THE NASA/LaRC 31-INCH CFHT ON AN 0.010-SCALE MODEL (32-OT) OF THE SPACE SHUTTLE CONFIGURATION 3 TO DETERMINE THE RCS JET FLOWFIELD INTERACTION EFFECTS ON AERODYNAMIC CHARACTERISTICS (IA60/0A105), VOLUME 1
D. E. Thornton (Rockwell Intern., Downey, Calif.) 6 Aug. 1974 278 p Revised
(Contract NAS9-13247)
(NASA-CR-134103; DMS-DR-2137-Vol-1-Rev-A) Avail: NTIS HC $17.00 CSCL 22B

Tests were conducted in the 31-inch continuous Flow Hypersonic Wind Tunnel to determine RCS jet interaction effect on the hypersonic aerodynamic and stability and control characteristics prior to RTLS abort separation. The model used was an 0.010-scale replica of the Space Shuttle Vehicle Configuration 3. Hypersonic stability data were obtained from tests at Mach 10.3 and dynamic pressure of 150 psf for the integrated Orbiter and external tank and the Orbiter alone. RCS modes of pitch, yaw, and roll at free flight dynamic pressure simulation of 7, 20, and 50 psf were investigated. The effects of speedbrake, bodyflap, elevon, and airleron deflections were also investigated. Author

N74-34320*# Chrysler Corp., New Orleans, La. Space Div.
STABILITY AND CONTROL CHARACTERISTICS FOR THE INNER MOLD LINE CONFIGURATION OF THE SPACE SHUTTLE ORBITER (OA110)
Terrance Hughes and Robert Rogge Aug. 1974 328 p Prepared by Rockwell Intern. Corp., Los Angeles, Calif.
(Contract NAS9-13247)
(NASA-CR-134406; DMS-DR-2155) Avail: NTIS HC $19.50 CSCL 22B

Experimental aerodynamic investigations were conducted on a sting mounted 0.0405-scale representation of the -140A/B inner mold line (IML) space shuttle orbiter in 7.75 x 11 foot low speed wind tunnel, during the time period from 18 March 1974 to 20 March 1974. The primary test objectives were to establish basic longitudinal and lateral-directional stability and control characteristics for the IML orbiter. Additional configurations investigated were sealed elevon hingeline gaps, sealed rudder split line and hingeline gaps, larger radius leading edge on the vertical tail, and sealed speedbrake base. Aerodynamic force and moment data for the orbiter were measured in the body-axis system by an internally mounted, six-component strain gage balance. The model was sting mounted with the center of rotation located at approximately the wing trailing edge. The nominal angle of attack range was from -4 to +30 degrees. Yaw polars were recorded over a nominal yaw angle range from -14 to +14 degrees at constant angles of attack of 0, + or - 5, 10, 15 and 20 degrees. Author

N74-34321*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF INVESTIGATIONS ON AN 0.004-SCALE 140A/B CONFIGURATION SPACE SHUTTLE VEHICLE ORBITER MODEL (34-0) IN THE NASA/LANGLEY RESEARCH CENTER HYPERSONIC HELIUM TUNNEL (OA88)
P. J. Hawthorne (Rockwell Intern., Downey, Calif.) Sep. 1974 74 p
(Contract NAS9-13247)
(NASA-CR-134409; DMS-DR-2125) Avail: NTIS HC $6.75 CSCL 22B

Data obtained during a wind tunnel test of an 0.004-scale 140A/B configuration SSV Orbiter are reported. The test was conducted at a nominal Mach number of 20 and at Reynolds numbers of 0.7, 1.1, 2.0, and 4 x 10 to the 6th power per foot. The complete 140A/B model was tested with various elevon settings and additionally in wing off/bodyflap off configurations at angles of attack from 18 to 54 degrees at zero yaw. This test was performed to obtain high hypersonic longitudinal and lateral-directional stability and control characteristics of the SSV configuration. Author

N74-34322*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT. GUIDANCE AND CONTROL SYSTEMS: COMMAND AND SERVICE MODULE STABILIZATION AND CONTROL SYSTEM
Orval P. Littleton Washington Sep. 1974 35 p
(NASA-TN-D-7785; JSC-S-410) Avail: NTIS HC $3.25 CSCL 22C

The concepts, design, development, testing, and flight results of the command and service module stabilization and control system are discussed. The period of time covered was from November 1961 to December 1972. Also included are a functional description of the system, a discussion of the major problems, and recommendations for future programs. Author

N74-34323*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT. CREW-SUPPORT ACTIVITIES FOR EXPERIMENTS PERFORMED DURING MANNED SPACE FLIGHT
John W. McKee Washington Sep. 1974 19 p refs
(NASA-TN-D-7782; JSC-S-403) Avail: NTIS HC $3.00 CSCL 05I

Experiments are performed during manned space flights in an attempt to acquire knowledge that can advance science and technology or that can be applied to operational techniques for future space flights. A description is given of the procedures that the personnel who are directly assigned to the function of crew support at the NASA Lyndon B. Johnson Space Center use to prepare for and to conduct experiments during space flight. Author

N74-34324*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT. GUIDANCE AND CONTROL SYSTEMS: ORBITAL RATE DRIVE ELECTRONICS FOR THE APOLLO COMMAND MODULE AND LUNAR MODULE
Roy B. Parker and Paul E. Sollock Washington Sep. 1974 32 p
(NASA-TN-D-7784; JSC-S-409) Avail: NTIS HC $3.25 CSCL 22B

A brief record of the development and use of the orbital-rate-drive assembly in the Apollo Program is presented. This device was procured as government-furnished equipment and was used on both the lunar module and the command module. Reviews of design, development, procurement, and flight experience are included. Author

N74-34325*# Lockheed Electronics Co., Houston, Tex.
ORBITAL MANEUVERING SUBSYSTEM FUNCTIONAL PATH ANALYSIS FOR PERFORMANCE MONITORING FAULT DETECTION AND ANNUNCIATION
E. L. Keesler Jul. 1974 54 p
(Contract NAS9-12200)
(NASA-CR-140243; LEC-3906; JSC-09131) Avail: NTIS HC $5.75 CSCL 22B

The functional paths of the Orbital Maneuver Subsystem (OMS) is defined. The operational flight instrumentation required for performance monitoring, fault detection, and annunciation is described. The OMS is a pressure fed rocket engine propulsion subsystem. One complete OMS shares each of the two auxiliary propulsion subsystem pods with a reaction control subsystem. Each OMS is composed of a pressurization system, a propellant tanking system, and a gimbaled rocket engine. The design, development, and operation of the system are explained. Diagrams of the system are provided. Author

N74-34326*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A STUDY OF FIRST MONTH SPACE MALFUNCTIONS
Albert R. Timmins Washington Oct. 1974 18 p refs
(NASA-TN-D-7750; G-7446) Avail: NTIS HC $3.00 CSCL 22C

The study examines the first-month space performance of 57 Goddard Space Flight Center spacecraft. It is a sequel to a previous study of first-day space malfunctions of the same 57 spacecraft. A total of 154 malfunctions, of which 88 were classified as failures, have been summarized by year of occurrence, by major subsystem of a spacecraft, by type of defect, and by severity. Of the 57 spacecraft, 45 had one or more failures during the first month in space. However, the mission criticality data show that, of the 154 malfunctions, less than 10 percent would have resulted in major loss (50-100 percent) to the mission, and due to redundancy, only 5 percent did result in major loss to the mission. The data show that more than 50 percent of the first month's failures occurred in the first operational day in space. The data also show that, for the first month in space, the ratio of system-test failures to space failures for various devices ranged from 3 to 1 up to 10 to 1. For six spacecraft programs, the ratios of test to space failures ranged from 2 to 1 up to 8 to 1. Author

N74-34327*# TRW Systems Group, Redondo Beach, Calif.
SPACE PROCESSING APPLICATIONS PAYLOAD EQUIPMENT STUDY. VOLUME 1: EXECUTIVE SUMMARY
R. L. Hammel Aug. 1974 45 p refs 3 Vol.
(Contract NAS8-28938)
(NASA-CR-120341; TRW-22886-6033-RU-00-Vol-1) Avail: NTIS HC $5.25 CSCL 22B

A study was conducted to derive and collect payload information on the anticipated space processing payload requirements for the Spacelab and space shuttle orbiter planning activities. The six objectives generated by the study are defined. Concepts and requirements for space processing payloads to accommodate the performance of the shuttle-supported research phase are analyzed. Diagrams and tables of data are developed to show the experiments involved, the power requirements, and the payloads for shared missions. Author

N74-34328*# TRW Systems Group, Redondo Beach, Calif.
SPACE PROCESSING APPLICATIONS PAYLOAD EQUIPMENT STUDY. VOLUME 2A: EXPERIMENT REQUIREMENTS
A. G. Smith and W. T. Anderson, Jr. Jul. 1974 78 p refs 3 Vol.
(Contract NAS8-28938)
(NASA-CR-120342; TRW-22886-6034-RU-00-Vol-2A) Avail: NTIS HC $7.00 CSCL 22B

An analysis of the space processing applications payload equipment was conducted. The primary objective was to perform a review and an update of the space processing activity research equipment requirements and specifications that were derived in the first study. The analysis is based on the six major experimental classes of: (1) biological applications, (2) chemical processes in fluids, (3) crystal growth, (4) glass technology, (5) metallurgical processes, and (6) physical processes in fluids. Tables of data are prepared to show the functional requirements for the areas of investigation. Author

N74-34329*# TRW Systems Group, Redondo Beach, Calif.
SPACE PROCESSING APPLICATIONS PAYLOAD EQUIPMENT STUDY. VOLUME 2B: PAYLOAD INTERFACE ANALYSIS (POWER/THERMAL/ELECTROMAGNETIC COMPATIBILITY)
R. L. Hammel, ed. and A. G. Smith, ed. Jul. 1974 152 p refs 3 Vol.
(Contract NAS8-28938)
(NASA-CR-120343; TRW-22886-6034-RU-01-Vol-2B) Avail: NTIS HC $10.75 CSCL 22B

As a part of the task of performing preliminary engineering analysis of modular payload subelement/host vehicle interfaces, a subsystem interface analysis was performed to establish the integrity of the modular approach to the equipment design and integration. Salient areas that were selected for analysis were power and power conditioning, heat rejection and electromagnetic capability (EMC). The equipment and load profiles for twelve representative experiments were identified. Two of the twelve experiments were chosen as being representative of the group and have been described in greater detail to illustrate the evaluations used in the analysis. The shuttle orbiter will provide electrical power from its three fuel cells in support of the orbiter and the Spacelab operations. One of the three shuttle orbiter fuel cells will be dedicated to the Spacelab electrical power requirements during normal shuttle operation. This power supplies the Spacelab subsystems and the excess will be available to the payload. The current Spacelab sybsystem requirements result in a payload allocation of 4.0 to 4.8 kW average (24 hour/day) and 9.0 kW peak for 15 minutes. Author

N74-34330*# TRW Systems Group, Redondo Beach, Calif.
SPACE PROCESSING APPLICATIONS PAYLOAD EQUIPMENT STUDY. VOLUME 2C: DATA ACQUISITION AND PROCESS CONTROL
M. Kayton and A. G. Smith Jul. 1974 53 p 3 Vol.
(Contract NAS8-28938)
(NASA-CR-120344; TRW-22886-6034-RU-02-Vol-2C) Avail: NTIS HC $5.75 CSCL 22B

The services provided by the Spacelab Information Management System are discussed. The majority of the services are provided by the common-support subsystems in the Support Module furnished by the Spacelab manufacturer. The information processing requirements for the space processing applications (SPA) are identified. The requirements and capabilities for electric power, display and control panels, recording and telemetry, intercom, and closed circuit television are analyzed. Author

N74-34331*# TRW Systems Group, Redondo Beach, Calif.
SPACE PROCESSING APPLICATIONS PAYLOAD EQUIPMENT STUDY. VOLUME 2D: SPA SUPPLEMENTAL POWER AND HEAT REJECTION KIT
R. L. Hammel, ed. and A. G. Smith, ed. Jul. 1974 94 p 3 Vol.
(Contract NAS8-28938)
(NASA-CR-120345; TRW-22886-6034-RU-03-Vol-2D) Avail: NTIS HC $7.75 CSCL 22B

The design and application of a supplementary power and heat rejection kit for the Spacelab are discussed. Two subsystems of electric power and thermal control were analyzed to define the requirements for the power and heat rejection kit (PHRK). Twelve exemplary experiments were defined and power timelines were developed. From these timeline, the experiment requirements for sustained power, peak power, and energy were determined. The electrical power subsystem of the PHRK will consist of two fuel cells, oxygen and hydrogen reactant tank assemblies, water storage tanks, plumbing, cabling, and inverters to convert the nominal 28 volt dc fuel cell output to ac power. Author

N74-34332*# TRW Systems Group, Redondo Beach, Calif.
SPACE PROCESSING APPLICATIONS PAYLOAD EQUIPMENT STUDY. VOLUME 2E: COMMERCIAL EQUIPMENT UTILITY
A. G. Smith, ed. Jul. 1974 64 p refs 3 Vol.
(Contract NAS8-28938)
(NASA-CR-120346; TRW-22886-6034-RU-04-Vol-2E) Avail: NTIS HC $6.25 CSCL 22B

Examination of commercial equipment technologies revealed that the functional performance requirements of space processing equipment could generally be met by state-of-the-art design practices. Thus, an apparatus could be evolved from a standard item or derived by custom design using present technologies. About 15 percent of the equipment needed has no analogous commercial base of derivation and requires special development.

This equipment is involved primarily with contactless heating and position control. The derivation of payloads using commercial equipment sources provides a broad and potentially cost-effective base upon which to draw. The derivation of payload equipment from commercial technologies poses other issues beyond that of the identifiable functional performance, but preliminary results on testing of selected equipment testing appear quite favorable. During this phase of the SPA study, several aspects of commercial equipment utility were assessed and considered. These included safety, packaging and structural, power conditioning (electrical/electronic), thermal and materials of construction.
Author

N74-34333*# TRW Systems Group, Redondo Beach, Calif.
SPACE PROCESSING APPLICATIONS PAYLOAD EQUIPMENT STUDY. VOLUME 3: PROGRAMMATICS
R. L. Hammel Jul. 1974 58 p 3 Vol.
(Contract NAS8-28938)
(NASA-CR-120347; TRW-22886-6035-RU-00-Vol-3) Avail: NTIS HC $6.00 CSCL 22B

The programmatic aspects of the space processing applications program and the methods of accommodating SPA payloads aboard the Shuttle/Spacelab host vehicle are discussed. An examination of the NASA traffic model shows that there exists a potential for 178 SPA payloads from the overall total of 727 flights specified. This could represent up to one quarter of the total shuttle flights during the 12-year-long period covered by the traffic model. The SPA payload will range from austere for shared flight opportunities to dedicated where space processing will encompass the total flight payload allocations. The major modes of use to SPA will include dedicated Spacelab missions, shared Spacelab missions and shared automated payloads attached to the pallet with the necessary control and display equipment in the host vehicle. Several layout drawings and artist's renderings have been completed to illustrate the various potential configurations available to accommodate the SPA payload equipment.
Author

N74-34334*# Chrysler Corp., New Orleans, La.
INVESTIGATIONS ON AN 0.030-SCALE SPACE SHUTTLE VEHICLE CONFIGURATION 140A/B ORBITER MODEL IN THE AMES RESEARCH CENTER UNITARY PLAN 8 BY 7-FOOT SUPERSONIC WIND TUNNEL (0A53C)
Mark E. Nichols Jul. 1974 1114 p refs Prepared by Rockwell Intern. Corp., Downey, Calif.
(Contract NAS9-13247)
(NASA-CR-134120; DMS-DR-2185) Avail: NTIS HC $58.50 CSCL 22B

A wind tunnel test was conducted of an 0.030 scale model of the space shuttle orbiter in a supersonic wind tunnel. Tests were conducted at Mach numbers of 2.5, 3.0, and 3.5. Reynolds numbers ranged from 0.75 million per foot to 4.00 million per foot. The objective of the test was to establish and verify longitudinal and lateral-directional aerodynamic performance, stability, and control characteristics for the configuration 140 A/B SSV Orbiter. Six-component force and moment data, base and cavity pressures, body-flap, elevon, speedbrake, and rudder hinge moments, and vertical tail forces and moments were measured.
Author

N74-34335*# Grumman Aerospace Corp., Bethpage, N.Y. Advanced Composite Group.
FABRICATION OF 1/3 SCALE BORON/EPOXY BOOSTER THRUST STRUCTURE, PHASE 2 Final Report, Jun. 1971 - Jun. 1972
Sep. 1974 99 p refs
(Contract NAS8-26675)
(NASA-CR-120471) Avail: NTIS HC $8.00 CSCL 22B

The design, materials, tooling, various manufacturing processes, quality control, test procedures, and results associated with the fabrication and testing of a 1/3 scale boron/epoxy, booster thrust structure are described. A complete two-dimensional truss type thrust structure, comprised of nine boron/epoxy tubular members and six apex fittings, was fabricated. This resulted in structurally representative flight hardware, and verified the manufacturing feasibility and projected weight savings (30%) for this type of structure.
Author

N74-34336*# Chrysler Corp., New Orleans, La. Space Div.
INVESTIGATION OF SPACE SHUTTLE ORBITER SUBSONIC STABILITY AND CONTROL CHARACTERISTICS AND DETERMINATION OF CONTROL SURFACE HINGE MOMENTS IN THE ROCKWELL INTERNATIONAL LOW SPEED WIND TUNNEL (OA37)
Terrance Hughes (Rockwell Intern., Downey, Calif.) Aug. 1974 507 p
(Contract NAS9-13247)
(NASA-CR-134408; DMS-DR-2140) Avail: NTIS HC $28.50 CSCL 22B

Experimental aerodynamic investigations were conducted on a string-mounted 0.030 scale representation of the 140A/B space shuttle orbiter in the 7.75- by 11-foot low speed wind tunnel. The primary test objectives were to establish basic longitudinal and lateral directional stability and control characteristics for the basic configuration plus control surface hinge moments. Aerodynamic force and moment data were measured in the body axis system by an internally mounted, six-component strain gage balance. Additional configurations investigated were sealed rudder hingeline gaps, sealed elevon gaps and compartmentized speedbrakes.
Author

N74-34337*# Chrysler Corp., New Orleans, La. Space Div.
EFFECT OF ENGINE SHROUD CONFIGURATION ON THE STATIC AERODYNAMIC CHARACTERISTICS OF A 0.00563 SCALE 142-INCH DIAMETER SOLID ROCKET BOOSTER (SA10F)
J. D. Johnson (NASA. Marshall Space Flight Center, Huntsville, Ala.) and W. F. Braddock (Northrop Services, Inc., Huntsville, Ala.) Aug. 1974 317 p refs
(Contract NAS9-13247)
(NASA-CR-134116; DMS-DR-2087) Avail: NTIS HC $19.00 CSCL 22B

A test of a 0.563 percent scale space shuttle Solid Rocket Booster (SRB) model, MSFC Model 449, was conducted in a trisonic wind tunnel. Test Mach numbers were 0.4, 0.6, 0.9, 1.2, 1.96, 3.48, 4.0, 4.45, and 4.96. Test angles-of-attack ranged from minus 10 degrees to 190 degrees. Test Reynolds numbers ranged from 3.0 million per foot to 8.6 million per foot. Test roll angles were 0, 11.25, 22.5, 45, and 90 degrees. In addition to the static stability evaluation of the primary SRB configuration, five parametric investigations were made: (1) effect of Reynolds number, (2) effect of engine shroud flare angle, (3) effect of engine shroud length, (4) effect of engine shroud strakes, and (5) effect of engine shroud strakes and trust vector control bottles.
Author

N74-34338*# International Business Machines Corp., Huntsville, Ala. Federal Systems Div.
STUDY ON SPACELAB SOFTWARE DEVELOPMENT AND INTEGRATION CONCEPTS Final Technical Report
13 Sep. 1974 302 p refs
(Contract NAS8-30538)
(NASA-CR-120472; IBM-74W-00224) Avail: NTIS HC $18.25 CSCL 22B

A study was conducted to define the complexity and magntiude of the Spacelab software challenge. The study was based on current Spacelab program concepts, anticipated flight schedules, and ground operation plans. The study was primarily directed toward identifying and solving problems related to the experiment flight application and tests and checkout software executing in the Spacelab onboard command and data management subsystem (CDMS) computers and electrical ground support equipment (EGSE). The study provides a conceptual base from which it is possible to proceed into the development phase of the Software Test and Integration Laboratory (STIL) and establishes guidelines for the definition of standards which will ensure that the total Spacelab software is understood prior to entering development.
Author

N74-34339*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: SPACECRAFT STRUCTURE SUBSYSTEM
P. D. Smith Washington Oct. 1974 60 p refs
(NASA-TN-D-7780; JSC-S-400) Avail: NTIS HC $3.75 CSCL 22B

The flightworthiness of the Apollo spacecraft structure was verified primarily through a rigorous, vehicle level, ground test program and flight tests. The failures and anomalies encountered during this testing were the major factors considered in determining necessary modifications to the basic design of the spacecraft structure. In this report, these failures, their causes, and their resolutions are discussed. A description of the spacecraft structure and discussions of the ground and flight test programs are presented. Author

N74-34340*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME 1: OVERALL SUMMARY
H. R. Howell 8 Apr. 1974 108 p refs
(Contract NAS9-10534)
(NASA-CR-140267; T169-28-Vol-1) Avail: NTIS HC $8.50 CSCL 22B

A summary is given of a series of thermal vacuum tests designed to support the development of the orbiter active thermal control system (ATCS) and included testing of a wide heat load range modular radiator system (MRS) configured to the March 1973 orbiter baseline system, a candidate weight reducing radiator/water cooling system, and a smaller radiator system with a high performance radiator coating. The tests verified the performance of the baseline system and obtained detailed design information for application of a wide heat load range modular radiator system to the orbiter. The two candidate ATCS weight reducing designs have undergone extensive concept verification testing and their system operating characteristics have been determined in sufficient detail for application to the orbiter. Design information has been obtained for an integrated radiator/water cooling system that provides for vehicle heat rejection as well as water management of the excess fuel cell water. Processing techniques have been developed and verified for the application of a high performance thermal control coating to large radiator areas subjected to a temperature range of -280 F to +160 F. Author

N74-34341*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME 2: MODULAR RADIATOR SYSTEM TESTS
P. B. Scheps, H. R. Howell, and F. E. Voss 23 Oct. 1973 212 p refs 8 Vol.
(Contract NAS9-10534)
(NASA-CR-140268; T169-28-Vol-2) Avail: NTIS HC $13.75 CSCL 22B

Tests were designed to investigate the validity of the 'modular' approach to space radiator system design for space shuttle and future applications by gathering performance data on various systems comprised of different numbers of identical panels, subject to nominal and extreme heat loads and environments. Both one-sided and two-sided radiation was tested, and engineering data was gathered on simulated low a/e coatings and system response to changes in outlet temperature control point. The results of the testing showed system stability throughout nominal orbital transients, unrealistically skewed environments, freeze-thaw transients, and rapid changes in outlet temperature control point. Various alternative panel plumbing arrangements were tested with no significant changes in performance being observed. With the MRS panels arranged to represent the shuttle baseline system, a maximum heat rejection of 76,600 Btu/hr was obtained in segmented tests under the expected worst case design environments. Testing of an alternate smaller two-sided radiation configuration yielded a maximum heat rejection of 52,931 Btu/hr under the maximum design environments. Author

N74-34342*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME 3: MODULAR RADIATOR SYSTEM TEST DATA CORRELATION WITH THERMAL MODEL
M. A. Phillips 18 Dec. 1973 150 p refs 8 Vol.
(Contract NAS9-10534)
(NASA-CR-140269; T169-28-Vol-3) Avail: NTIS HC $10.50 CSCL 22B

Results are presented of an analysis which compares the performance predictions of a thermal model of a multi-panel modular radiator system with thermal vacuum test data. Comparisons between measured and predicted individual panel outlet temperatures and pressure drops and system outlet temperatures have been made over the full range of heat loads, environments and plumbing arrangements expected for the shuttle radiators. Both two sided and one sided radiation have been included. The model predictions show excellent agreement with the test data for the maximum design conditions of high load and hot environment. Predictions under minimum design conditions of low load-cold environments indicate good agreement with the measured data, but evaluation of low load predictions should consider the possibility of parallel flow instabilities due to main system freezing. Performance predictions under intermediate conditions in which the majority of the flow is not in either the main or prime system are adequate although model improvements in this area may be desired. The primary modeling objective of providing an analytical technique for performance predictions of a multi-panel radiator system under the design conditions has been met. Author

N74-34343*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME 4, BOOK 1: MODULAR RADIATOR SYSTEM TEST DATA
P. B. Scheps, F. E. Voss, and H. R. Howell 23 Oct. 1973 526 p 8 Vol.
(Contract NAS9-10534)
(NASA-CR-140270; TI69-28-Vol-4-Bk-1) Avail: NTIS HC $29.50 CSCL 22B

A three-week test of a modular radiator system was conducted and plots of all key data recorded during the three-week test are presented. Author

N74-34344*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME 4, BOOK 2: MODULAR RADIATOR SYSTEM TEST DATA
P. B. Scheps, F. E. Voss, and H. R. Howell 23 Oct. 1973 440 p
(Contract NAS9-10534)
(NASA-CR-140271; TI69-28-Vol-4-Bk-2) Avail: NTIS HC $25.00 CSCL 22B
For abstract, see N74-34343.

N74-34345*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME 5: INTEGRATED RADIATOR/EXPENDABLE COOLING SYSTEM TESTS
P. B. Scheps 15 Apr. 1974 415 p refs 8 Vol.
(Contract NAS9-10534)
(NASA-CR-140272; T169-28-Vol-5) Avail: NTIS HC $23.75 CSCL 22B

Tests were conducted to gather data on a space shuttle active control system (ATCS) incorporating both radiators and an expendable cooling device to provide vehicle heat removal. Two systems were tested and design information was provided for both nominal and limit conditions. The tests verified the concept that an integrated radiator/expendable cooling system can adequately maintain desired water quantities while responding to variations in heat loads and environments. In addition, the need for duct heating was demonstrated, while exhaust nozzle heating was also shown to be unnecessary. Author

N74-34346*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME 6: WATER EJECTOR PLUME TESTS
F. K. McGinnis and R. M. Summerhays 16 Nov. 1973 47 p refs 8 Vol.
(Contract NAS9-10534)

(NASA-CR-140273; TI69-28-Vol-6) Avail: NTIS HC $5.50 CSCL 22B

Results are given of vacuum testing of nozzles designed to eject water vapor away from the space shuttle to prevent contamination of the spacecraft surfaces and payload. The water vapor is generated by an active cooling system which evaporates excess fuel cell water to supplement a modular radiator system (MRS). The complete heat rejection system including the MRS, flash evaporator or sublimator and nozzle were first tested to demonstrate the system operational characteristics. The plume tests were performed in two phases and the objectives of this test series were: (1) to determine the effectiveness of a supersonic nozzle and a plugged nozzle in minimizing impingement upon the spacecraft of water vapor exhausted by an active device (flash evaporator or sublimator); and (2) to obtain basic data on the flow fields of exhaust plumes generated by these active devices, both with and without nozzles installed. Author

N74-34347*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.

SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME 7: IMPROVED RADIATOR COATING ADHESIVE TESTS

M. W. Reed 16 Nov. 1973 64 p refs 8 Vol.
(Contract NAS9-10534)
(NASA-CR-140274; TI69-28-Vol-7) Avail: NTIS HC $6.25 CSCL 22B

Silver/Teflon thermal control coatings have been tested on a modular radiator system projected for use on the space shuttle. Seven candidate adhesives have been evaluated in a thermal vacuum test on radiator panels similar to the anticipated flight hardware configuration. Several classes of adhesives based on polyester, silicone, and urethane resin systems were tested. These included contact adhesives, heat cured adhesives, heat and pressure cured adhesives, pressure sensitive adhesives, and two part paint on or spray on adhesives. The coatings attached with four of the adhesives, two silicones and two urethanes, had no changes develop during the thermal vacuum test. The two silicone adhesives, both of which were applied to the silver/Teflon as transfer laminates to form a tape, offered the most promise based on application process and thermal performance. Each of the successful silicone adhesives required a heat and pressure cure to adhere during the cryogenic temperature excursion of the thermal-vacuum test. Author

N74-34348*# LTV Aerospace Corp., Dallas, Tex. Vought System Div.

SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME 8: TUBE ANOMALY INVESTIGATION

M. W. Reed 5 Apr. 1974 54 p 8 Vol.
(Contract NAS9-10534)
(NASA-CR-140275; TI69-28-Vol-8) Avail: NTIS HC $5.75 CSCL 22B

A modular radiator system projected for use on the space shuttle has been tested. During thermal vacuum testing of the radiator panels leaks developed in the coolant fluid tubes containing the Freon 21 refrigerant. An analysis of thermal vacuum test conditions revealed that the test anomaly consisted of trapped Freon 21 fluid between frozen tube corners colder than the remainder of the panel. The trapped fluid expanded on further warming, causing high pressures to develop in the tubes. The pressure was sufficient to induce tube ruptures. Metallurgical analysis showed that concentric extrusion holes and heat treatment of the aluminum alloy to the -T6 condition would have prevented the ruptures. Thermal analysis indicates that attaching the tube corners to the radiator fin could eliminate the fluid trapping. Author

N74-34349# Societe Nationale Industrielle Aerospatiale, Cannes (France).

LOUVRES FOR SATELLITE THERMAL CONTROL

P. Croiset and L. Leroy Paris ESRO Dec. 1973 110 p refs In FRENCH; ENGLISH summary
(Contract ESTEC-1190/70)
(ESRO-CR-208) Avail: NTIS HC $8.50

Design, development, and qualification testing of a louver array for active satellite thermal control was carried out. Performance predictions for the array were established by means of computer programs and then verified experimentally on a mockup and on a prototype. The system behavior in the launching environment was verified by mechanical and acoustic tests. Author (ESRO)

N74-34350# Centre National de la Recherche Scientifique, Marseilles (France). Lab. d'Astronomie Spatiale.

JANUS ROCKET NOSE SIMULATION STUDY [ETUDE DE LA SIMULATION DE LA TETE DE FUSEE JANUS]

Jean-Marie Perrin Aug. 1972 120 p In FRENCH
(ELEC/JAN-045-73) Avail: NTIS HC $9.00

Computerized Simulation of the Janus rocket nose was studied. The Janus experiment envisage is described, including scientific purpose and importance, scientific equipment, experiment planning, and expected results. The Janus rocket nose computerized simulation is dealt with, notably material used, disc management system, computer-peripherals interface, and drives. The FORTRAN computer programs are listed. ESRO

N74-34351# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.

KINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964-1965, PART 9

K. S. Russell 20 May 1974 37 p ref
(ROE-STS-180-pt-9) Avail: NTIS HC $5.00

Timed observations, made in azimuth and elevation with a cinetheodolite at Earlyburn Outstation, are listed in satellite launch and time order: fully reduced observations of 29 transits of satellites 1963-030A, 1963-030D and 1963-38A. Author (ESRO)

N74-34352# British Aircraft Corp. (Operating) Ltd., Bristol (England). Guided Weapons Publications Dept.

STUDY OF AN INTERFACE STRUCTURE DESIGN, PHASE 2 Final Report

M. A. Neads and K. J. Zimmermann Aug. 1974 244 p refs Prepared jointly with Contraves AG
(Contract ESTEC-1832/72-AA)
(ESS/SS-526; ESRO-CR(P)-484) Avail: NTIS HC $15.25

Strength and stiffness analyses are presented for two different interface structural configurations selected in the phase 1 study based on mission types. The configurations are a conical structure for the geosynchronous mission spacecraft, and a honeycomb platform attached to a flanged separation ring for the low earth orbit spacecraft. Both configurations use beryllium as the main load carrying material. In the analyses the detailed dimensions (optimized within the design restraints for minimum structural mass), associated stress levels, deflections, fundamental frequencies, and response were calculated for each structural configuration. ESRO

N74-34353# National Aerospace Lab., Amsterdam (Netherlands). Space Flight Technology Div.

PREPARATORY STUDY OF SATELLITE ATTITUDE CONTROL WITH MOMENTUM WHEELS

G. Boersma and F. J. Sonnenschein 16 Jun. 1972 56 p refs Supersedes NLR-Memo-R-72-016 Sponsored by Neth. Agency for Aerospace Programs
(NLR-TR-72148-U; NLR-Memo-R-72-016) Avail: NTIS HC $6.00

A survey is given of launched satellites, paying special attention to mission objectives and attitude control systems. This picture is extrapolated into the near future to analyze the control requirements that are to be expected for future satellite missions. Possible attitude control systems for satellites are also surveyed and are compared with respect to their abilities to meet the expected requirements. It appears that double gimballed momentum wheels are the most promising solution especially for earth-pointing satellites, with high accuracy and long mission life. Preparations are made for further study of double gimballed momentum wheels. These preparations comprise a selection of representative satellite missions, and an estimation of the disturbance torques. Author ESRO

N74-34354# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.

ACCURACY OF ATTITUDE CONTROL SYSTEMS FOR

SATELLITES USING DOUBLE GIMBALLED MOMENTUM WHEELS

G. Boersma and F. J. Sonnenschein 17 May 1973 103 p refs Sponsored by Neth. Agency for Aerospace Programs (NLR-TR-73055-U) Avail: NTIS HC $8.25

The characteristics of double gimballed momentum wheels are explored with respect to their use in geostationary satellites (active and semiactive), low orbit earth pointing satellites (active and semi-active), and in astronomical satellites. Special attention is paid to the effect of control laws and gimbal suspension on the accuracy of the system. The pointing error of an active control system for a geostationary satellite can be kept low (0.05 deg) and is hardly affected by the gimbal suspension. Semi-active systems give large yaw errors due to disturbance torques; with these systems, the required accuracy cannot be maintained during station keeping, unless estimation techniques are used. The total pointing error is in the order of 0.2 deg for low orbit earth pointing satellites, due to uncertainties in the measured position of the horizon. The accuracy of astronomical satellite control systems with double gimballed momentum wheels is nearly equal to that of a system with control moment gyroscopes. ESRO

N74-34355# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.

STABILITY OF DOUBLE GIMBALLED MOMENTUM WHEELS

G. Boersma and F. J. Sonnenschein 1 Oct. 1973 51 p refs Sponsored by Neth. Agency for Aerospace Programs (NLR-TR-73112-U) Avail: NTIS HC $5.75

Due to the finite stiffness of rotor- and gimbal-suspensions, a double gimballed momentum wheel oscillates with high natural frequencies. The stability of these oscillations is studied, in order to obtain requirements for the stiffness of the suspensions and/or the gimbal inertia properties. From energy considerations, it is concluded that double gimballed momentum wheels are liable to suffer from instability, if the suspension is such, that the force in a certain direction depends on the displacement in a perpendicular direction. This will occur for hydrodynamic rotor bearings. For a momentum wheel using these bearings, an equation for the boundary of the stable region is derived and approximate solutions of this equation are obtained. The approximate solutions are compared with numerical solutions - obtained using a digital computer - for some typical configurations. Author (ESRO)

N74-34356# Institute for Defense Analyses, Arlington, Va. Science Technology Div.

CURRENT (FY 73) ISSUES REGARDING REUSABILITY OF SPACECRAFT AND UPPER STAGES FOR MILITARY MISSIONS Final Report

R. G. Finke Jun. 1974 59 p refs (Contract DAHC15-73-C-0200) (AD-781468; P-997; IDA/HQ-73-15808) Avail: NTIS CSCL 22/2

The study examined the possible contributions to military space missions of the new capabilities introduced by the space shuttle: (1) payload recovery, (2) manned tending, and (3) increased payload weight and volume at lower cost. Besides the conventional expendable mode of satellite operations, new modes of retrieval for ground refurbishment and reuse, on-orbit servicing, and on-board (sortie-mode) payloads become possible. The issue of the degree of reusability of an upper stage (tug) to be developed for use with the shuttle for high-altitude missions was also examined by the study. Including both transportation and payload cost savings, the results of the analysis could not support, on an economic basis, military use of a reusable tug in preference to a minimum modification of an existing expendable stage in conjunction with extended-lifetime expendable spacecraft. (Modified author abstract) GRA

N74-34357# General Dynamics/Pomona, Calif.

STRUCTURAL DYNAMIC PROPERTIES OF TACTICAL MISSILE JOINTS, PHASE 3 Final Report, May 1972 - Jan. 1974

George Lasker, John G. Maloney, Michael T. Shelton, and David A. Underhill May 1974 186 p refs (Contract N00019-72-C-0507) (AD-781317; CR-6-348-945-003) Avail: NTIS CSCL 16/4

The results of a third and final phase in a general study of the structural dynamic properties of tactical missile airframe joints are presented. The overall objectives of the study were to provide a better understanding of mechanical joint effects on missile dynamic response, to improve methods for predicting and representing their characteristics in system simulation and response studies. Finite element structural analysis techniques started in Phase 1 are shown to be capable of providing reliable estimates of joint compliance in complex actual missile structures. A technique for extracting joint compliance values from missile model test data started in Phase 1 is refined to improve convergence and user convenience. A user's manual for the joint compliance extraction digital computer code is included as an appendix to the report. (Modified author abstract) GRA

N74-34358# Honeywell, Inc., St. Petersburg, Fla. Aerospace Div.

COMPUTER FUNCTIONAL REQUIREMENTS STUDY, VOLUME 2 Final Technical Report, Jun. 1971 - Sep. 1973

Ronald G. Blake, Floyd D. Johnson, Gerald F. Muething, Patrick R. Nugent, and Andrew J. Perlowski May 1974 165 p refs (Contract F04701-71-C-0327) (AD-782079; SAMSO-TR-74-51-Vol-2) Avail: NTIS CSCL 17/7

The objective of this study was to assess advanced guidance system computer requirements and functionally define a computer architecture meeting these requirements while incorporating the advances being made in hardware technology, software utilization, and system organization. The report documents the results of that study and presents a functional design capable of meeting the postulated requirements of the 1975 - 1980 time frame. The document consists of three separate volumes. Volume 2 provides a description of the software features of the processors in Volume 1 along with a description of the instruction repertories. GRA

N74-34359# Honeywell, Inc., St. Petersburg, Fla. Aerospace Div.

COMPUTER FUNCTIONAL REQUIREMENTS STUDY, VOLUME 3 Final Technical Report, Jun. 1971 - Sep. 1973

Ronald G. Blake, Floyd D. Johnson, Gerald F. Muething, Patrick R. Nugent, and Andrew J. Perlowski May 1974 26 p refs (Contract F04701-71-C-0327) (AD-782080; SAMSO-TR-74-51-Vol-3) Avail: NTIS CSCL 17/7

The objective of this study was to assess advanced guidance system computer requirements and functionally define a computer architecture meeting these requirements while incorporating the advances being made in hardware technology, software utilization, and system organization. The report documents the results of that study and presents a functional design capable of meeting the postulated requirements of the 1975-1980 time frame. The document consists of three separate volumes. Volume 3 presents a description of the computer functional requirements study (CFRS)-SPL software development techniques using the SPL Implementation Tool (SPLIT) as specified in the CFRS SPL/SPLIT Applications Program. This volume contains recommended improvements to the existing SPL/SPLIT software package. GRA

N74-34360# Avco Corp., Wilmington, Mass. Systems Div.

DETERMINATION OF SATELLITE OBSERVABLES. VOLUME 4: OPTICAL PROPERTIES OF SATELLITE MATERIALS Final Report, 24 Apr. 1972 - 12 Nov. 1973

M. E. Bair, D. Carmer, D. Zuk, and G. Suits May 1974 300 p refs Prepared in cooperation with Environmental Research Inst. of Michigan (Contract F04701-72-C-0353; F04701-72-C-0360) (AD-782093; AVSD-0085-74-CR-Vol-4; SAMSO-TR-73-291-Vol-4) Avail: NTIS CSCL 22/2

The optical properties of selected satellite surface materials were measured; these materials included solar cells, thermal control mirrors, reflective tape, and various painted surface. All samples were prepared using actual vehicle substrates and flight test assembly procedures. Measurement data reported include: (1) spectral directional reflectance and/or emittance over the UV0.24- to IR22- micrometers spectral range; (2) bidirectional

reflectance at coherent wavelengths of 0.63, 1.06 and 10.6 micrometers and a visible solar simulation band extending from 0.4 to 0.7 micrometers; and (3) surface distribution information on samples having a significant specular component -- given as direction normal orientation of individual sample elements. Instrumentation measurement techniques are discussed, and the results, showing significant specular returns from solar cells, are presented in tabular or graphical format. Data interpretation and variability are also discussed. Author (GRA)

N74-34361# Army Materiel Systems Analysis Agency, Aberdeen Proving Ground, Md.
LABORATORY COMPONENT TEST RESULTS AND ANALYSIS OF THE AGM22B MISSILE FOURTH CYCLE
Benedict C. Kowalczyk Mar. 1974 32 p
(DA Proj. 1T7-65706-M-541)
(AD-781953; AMSAA-TM-178) Avail: NTIS CSCL 15/4

The reliability of AGM22B missiles, after extended environmental exposure, was investigated. Fourth cycle test results and engineering analysis of component degradation, failures and other shortcomings of the missile are discussed in great detail. Failures and problems that resulted from corrosive actions and which were detected in the previous (third) cycle occurred in greater frequency and severity as a result of their additional year of environmental exposure. These defects are still restricted only to the missiles which are stored in the Panama Canal Zone area. One electronic guidance decoder, from an Arctic Test missile, was found to contain a defective transistor which would have seriously affected the pitch command and guidance channel of the missile. Two missiles which had been stored in the Canal Zone were found to have open gyro and rocket motor igniter circuits. Neither of these two missiles would have launched if an attempt was made to fire them at a tactical target.
Author (GRA)

N74-34362# Bell Aerospace Co., Buffalo, N.Y.
SYSTEM ACCESS CONTROL STUDY Final Report, Jan. 1973 - Jan. 1974
L. Shub, D. Allen, E. Clune, and T. Lerner Jun. 1974 317 p refs
(Contract DOT-TSC-539)
(AD-782256; TSC-FAA-74-16) Avail: NTIS CSCL 17/7

The report presents a summary of a study conducted for the Transportation Systems Center of promising access control techniques which are applicable to an aeronautical satellite system. Several frequency division multiple access (FDMA) and time division multiple access (TDMA) configurations are analyzed and compared which are capable of providing voice, data and independent surveillance services. One of the FDMA concepts and a burst TDMA system are rated highest and are presented in greatest detail. Procedures are outlined for different types of entry, beam switching and handling various types of interconnections. Included are preliminary designs of the avionics instrumentation. Author (GRA)

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N74-34363# National Physical Lab., Teddington (England). Div. of Maritime Science.
MEASUREMENTS OF PRESSURE FLUCTUATIONS ON A MODEL OF THE CAARC STANDARD TALL BUILDING
J. A. B. Wills and P. Jones May 1974 35 p
(NPL-Mar-Sci-R-115) Avail: NTIS HC $4.75

Wind tunnel tests were conducted using scale models of standard idealized buildings to determine the pressure fluctuations due to wind loading. The parameters of the models are defined. The instrumentation and test equipment used to obtain the data are described. Mean pressure and mean-square pressure fluctuations were obtained from the output of reactance converters using analog equipment. Spectra were obtained by on-line Fourier transformation of the autocorrelation function of the pressure fluctuation signals. A block diagram of the test system is shown. The experimental results are tabulated to show the values of normalized root mean square pressure fluctuation. Author

N74-34364*# Martin Marietta Corp., Denver, Colo.
DESIGN, FABRICATION, AND TEST OF LIGHTWEIGHT SHELL STRUCTURE, PHASE 2 Quarterly Progress Report, 1 Jun. - 31 Aug. 1974
31 Aug. 1974 64 p refs
(Contract NAS8-29979)
(NASA-CR-120458; MCR-74-167-Issue-2; QPR-2) Avail: NTIS HC $6.25 CSCL 20K

A cylindrical shell skirt structure 4.57 m (180 in.) in diameter and 3.66 m (144 in.) high was subjected to a design and analysis study using a wide variety of structural materials and concepts. The design loading of 1225.8 N/cm (700 lb/in.) axial compression and 245.2 N/cm (140 lb/in.) torsion is representative of that expected on a typical space tug skirt section. Structural concepts evaluated included honeycomb sandwich, truss, isogrid, and skin/stringer/frame. The materials considered included a wide variety of structural metals as well as glass, graphite, and boron-reinforced composites. The most unique characteristic of the candidate designs is that they involve the use of very thin-gage material. Fabrication and structural test of small panels and components representative of many of the candidate designs served to demonstrate proposed fabrication techniques and to verify design and analysis methods. Author

N74-34365*# General Dynamics/Convair, San Diego, Calif.
CONICAL ISOGRID ADAPTER STRUCTURAL TEST RESULTS. APPENDIX C: CYLINDRICAL ISOGRID STRUCTURES
Jul. 1974 78 p refs
(Contract NAS8-29859)
(NASA-CR-120463; PD-73-0123) Avail: NTIS HC $7.00 CSCL 20K

Analysis techniques and data for evaluating the load carrying capabilities of cylindrical isogrid structures subjected to compression and body bending loads are presented. Structural tests were conducted on a 120-inch diameter by 37-inch long cylindrical adapter. Photographs and drawings of the flanged isogrid adapter structure are included. The subjects considered are: (1) summary of the test data resulting from structural analysis, (2) techniques for predicting local and general instability, (3) a method for predicting extended local instability, (4) the effects of basic parameter and constant variations in extended local stability analysis, and (5) evaluation of effective skin width and compression buckling of skin panels on the basis of test data. Author

N74-34366*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SOME EFFECTS OF TIP FINS ON WING FLUTTER CHARACTERISTICS
Robert C. Goetz and Robert V. Doggett, Jr. Washington Oct. 1974 33 p refs
(NASA-TN-D-7702; L-9644) Avail: NTIS HC $3.25 CSCL 20K

A wind tunnel investigation has been conducted over the Mach number range from about 0.6 to 1.2 to determine the effects of large tip fins on the flutter characteristics of a swept wing. The basic wing configuration had an aspect ratio of 0.95, leading-edge sweep of 40 deg 0, and trailing-edge sweep of 21 deg. Two of these configurations were modified with tip fins of 60 deg dihedral and had effective aspect ratios of 1.5 and 2.2. In general, the results indicate that the addition of tip fins reduces the flutter speed, with the larger fin having the greater effect. Comparison of the experimental flutter speeds at Mach numbers between 0.60 and 0.90 with calculated values obtained by using doublet-lattice unsteady aerodynamic theory was good. Analytical results where structural and aerodynamic effects of the tip fins were isolated indicated that the reduction in flutter speed produced by the addition of the fins was caused by both effects, with the structural effect being the more pronounced.
Author

N74-34367# Lockheed Missiles and Space Co., Palo Alto, Calif.
DEFORMATION OF THIN THREE-DIMENSIONAL CAVERNS

IN A GRAVITY FLUID UNDER THE EFFECT OF LIFT ON THE CAVITATOR
V. N. Buivol [1974] 4 p refs Transl. into ENGLISH from Prikl. Mekh. (USSR), v. 10, no. 7, 1974 p 120-125
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The influence of cavitator lift on the curvature of the cavern axis is analyzed. An approximate formula for the curvature of the cavern axis is developed based on the application of momentum theorems. The cavitator is assumed to be moving in a weightless fluid. A complete solution of the problem of the influence of the cavitator lift on the deformation of a cavity in a gravity fluid is presented. Mathematical models are developed to support the theoretical considerations. Author

N74-34368*# Mechanical Technology, Inc., Latham, N.Y.
DEVELOPMENT OF PROCEDURES FOR CALCULATING STIFFNESS AND DAMPING PROPERTIES OF ELASTOMERS IN ENGINEERING APPLICATIONS. PART 2: ELASTOMER CHARACTERISTICS AT CONSTANT TEMPERATURE
Pradeep K. Gupta, Juergen M. Tessarzik, and Loretta Cziglenyi 26 Apr. 1974 123 p refs
(Contract NAS3-15334)
(NASA-CR-134704; MTI-74TR20-Pt-2) Avail: NTIS HC $9.25 CSCL 20K

Dynamic properties of a commerical polybutadiene compound were determined at a constant temperature of 32 C by a forced-vibration resonant mass type of apparatus. The constant thermal state of the elastomer was ensured by keeping the ambient temperature constant and by limiting the power dissipation in the specimen. Experiments were performed with both compression and shear specimens at several preloads (nominal strain varying from 0 to 5 percent), and the results are reported in terms of a complex stiffness as a function of frequency. Very weak frequency dependence is observed and a simple power law type of correlation is shown to represent the data well. Variations in the complex stiffness as a function of preload are also found to be small for both compression and shear specimens. Author

N74-34369*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
MIXED MODE STRESS INTENSITY FACTORS FOR SEMIELLIPTICAL SURFACE CRACKS
F. W. Smith and D. R. Sorensen Jun. 1974 103 p refs
(Grant NGL-06-002-063)
(NASA-CR-134684) Avail: NTIS HC $8.25 CSCL 20K

The three-dimensional equations of elasticity are solved for a flat elliptical crack which has nonuniform shear stresses applied to its surfaces. An alternating method is used to determine the mode two and mode three stress intensity factors for a semielliptical surface crack in the surface of a finite thickness solid. These stress intensity factors are presented as a function of position along the crack border for a number of crack shapes and crack depths. This same technique is followed to determine the mode one stress intensity factors for the semielliptical surface crack which has normal loading applied to its surface. Mode one stress intensity factors are presented and compared with the results obtained from previous work. Author

N74-34370# Bendix Corp., Kansas City, Mo.
IMPACT TESTING OF FOAM-FILLED PAPER HONEYCOMB WITH ENERGY-ABSORPTION CHARACTERISTICS COMPARED TO BALSA AND REDWOOD Final Report
L. F. Thorne and R. D. Jump May 1974 84 p Revised
(Contract AT(29-1)-613)
(BDX-613-946-Rev) Avail: NTIS HC $7.25

Foam-impregnated paper honeycomb structures were impact tested at velocities between 150 fps and 318 fps (45.7 and 96.9 m/s). The effect of velocity upon crush strength and the energy absorbed per pound of sample material were studied. The efficiency of epoxy-foam-impregnated paper honeycomb as an energy-absorber was compared to balsa and redwood. Test data suggest that epoxy-foam filled paper honeycomb can be made equivalent to wood for use as an energy-absorber at the velocities studied if its density can be lowered for 24.2 lb/cu ft (387.7 kg/cu m) to the approximate density of redwood (17.4 lb/cu ft or 278.4 kg/cu m) by changing its composition. Author

N74-34371# Sandia Labs., Albuquerque, N.Mex.
THERMAL STRESS AND CREEP
R. E. Nickell 1973 20 p refs Presented at the Intern. Symp. on Structural Mech. Software, College Park, Md., 12-14 Jun. 1974 Sponsored by AEC
(SLA-74-5190; Conf-740604-2) Avail: NTIS HC $4.00

Computer programs designed to analyze problems of time-dependent flow in solids (creep and/or recovery) are surveyed. Special attention is given to the manner in which the temperature field is supplied to the stress analysis module and to data input procedures for temperature-dependent flow parameters. The computer programs are divided into four classes, based primarily on geometrical capability: (1) historical, (2) one-dimensional, (3) two-dimensional, and (4) general purpose. Algorithmic details that are particularly germane to the creep problem-such as automatic increment control, iteration within the increment based on error tolerances, tangent modulus vs. initial strain approaches, flow and hardening rules, and equations of state are discussed. Program sources, documentation, availability and maintenance organizations are listed.
Author (NSA)

N74-34372# Sandia Labs., Albuquerque, N.Mex.
FRACTURE MECHANICS
S. E. Benzley and D. M. Parks (Brown Univ.) 1973 23 p refs Presented at the Intern. Symp. on Structural Mech. Software, College Park, Md., 12-14 Jun. 1974 Sponsored by AEC
(SLA-74-5181; Conf-740604-1) Avail: NTIS HC $4.25

Some fracture mechanics computer programs currently being used are surveyed. Most of this software represents very recent developments in computational fracture mechanics. Included are brief abstracts of computer programs that treat the characteristic near-field singularity that is present at the tip of a crack. A critical review of computational fracture mechanics is offered and some suggestions are given as to the proper selection of fracture mechanics software for a particular problem. Future trends in this field are presented. Author (NSA)

N74-34373# Sandia Labs., Albuquerque, N.Mex.
NONLINEAR CONTINUA
W. A. VonRiesemann, J. A. Stricklin (Texas A and M Univ.), and W. E. Haisler (Texas A and M Univ.) 1974 35 p refs Presented at the Intern. Symp. on Structural Mech. Software, College Park, Md., 12-14 Jun. 1974
(SLA-74-5215; Conf-740604-3) Avail: NTIS HC $4.75

The software available for nonlinear continuum is surveyed, and where possible assessments are made. Primarily, the nonlinearities considered are geometric (large displacement), material, and large strain. The main emphasis of the paper is on the actual software and not on the methods of analysis. The programs surveyed fall into two categories: the so-called hydrodynamic or wave propagation codes, which are primarily finite difference, and structural response codes that primarily use the finite element method for solids and both finite difference/element methods for shells. Some guidelines and suggestions for potential users are discussed. The survey includes programs that will be available in the near future. Author (NSA)

N74-34374# Ottawa Univ. (Ontario).
VIBRATION FREQUENCIES AND MODAL SHAPES FOR MULTI-SPAN BEAMS WITH UNIFORMLY SPACED SUPPORTS
D. J. Gorman and R. K. Sharma [1974] 18 p refs Presented at the 7th Southeastern Conf. on Theoretical and Appl. Mech., Washington, D. C.
(Conf-740330-1) Avail: AEC Depository Libraries HC $4.00

A comprehensive analysis of the lateral vibration of uniform beams with equispaced intermediate supports has been conducted. All possible combinations of outer supports; namely, clamped, free or pinned; have been studied. Frequency data and modal shape expressions are provided for all cases. It is anticipated that these results will find much useful application, particularly in the design and development of heat exchangers and boilers.
Author (NSA)

N74-34375# Commissariat a l'Energie Atomique, Saclay (France).
USE OF COMPUTERS FOR PLASTIC ANALYSIS OF SHELLS: DESCRIPTION OF PLASTIC BEHAVIOUR AND LIMIT

ANALYSIS METHODS
A. Hoffmann, R. Roche, and S. Goldstein 1973 32 p refs Presented at the 2d Intern. Congr. for Pressure Vessel and Piping Technol., San Antonio, Tex.
(CEA-Conf-2576; Conf-731003-8) Avail: AEC Depository Libraries HC $4.75

The utility of the plastic analysis of pressure vessels was examined. A brief description of the work already accomplished in this field is given. Conventional plastic analysis methods can be used for shells; but for these a global plasticity model is proposed which takes tensile stresses and moments directly into account. Such a model is described. It leads to considerable simplification in the calculations. A few applications are described. The PASTEL programs in their axisymmetric version and POCO for shells of any shape were created for the elastic and plastic analysis of complex structures. Author (NSA)

N74-34376# Commissariat a l'Energie Atomique, Saclay (France).
COMPARISON BETWEEN EXPERIMENTAL AND COMPUTER ANALYSES OF THE BEHAVIOUR UNDER PRESSURE OF A 90 DEG BEND WITH AN ELLIPTICAL SECTION
B. Vrillon, R. Roche, and G. Baylac 1973 34 p refs Presented at the 2d Intern. Congr. for Pressure Vessel and Piping Technol., San Antonio, Tex.
(CEA-Conf-2575; Conf-731003-9) Avail: AEC Depository Libraries HC $4.75

The development of industrial techniques requires a detailed analysis of the behavior of pressure vessels. The possible modes of failure must be taken into consideration. Calculation methods are generally based on an elastic analysis and hence it is necessary to understand the final results and to distinguish for example between different types of stresses, i.e., primary, secondary, peak, etc. This distinction is particularly difficult in some cases, including that developed here, which concerns a 90 deg bend of large diameter (about 2 meters) subject to a working pressure of 25 bars and possessing a central section in the form of a cylinder with an elliptical base. The characteristics of the structure led to the carrying out of two simultaneous analyses, by experiment and by computer analysis. The comparison of the results obtained was very instructive. The experimental analysis was performed on two mock-ups equipped with the appropriate instruments, i.e., electric strain gages, elongation transducers, etc.
Author (NSA)

N74-34377# Commissariat a l'Energie Atomique, Bruyeres-le-Chatel (France).
STUDY OF ELASTOPLASTIC DEFORMATIONS OF FLAT CYLINDERS SELF-FRETTED BY MANDRELING
R. Caron Apr. 1974 172 p refs In FRENCH
(CEA-R-4554) Avail: AEC Depository Libraries HC $11.75

Theoretical and experimental studies were made of elastoplastic deformation of flat cylinders self fretted by mandreling. Data cover high pressure effects and the resistance properties of the cylinders. Some attention was directed to procedures for determining high pressure and plastic properties of the cylinders. Transl. by E.H.W.

N74-34378# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Reactors Div.
INELASTIC AND CREEP BUCKLING OF CIRCULAR CYLINDER DUE TO AXIAL COMPRESSION, BENDING, AND TWISTING
D. S. Griffin Dec. 1973 24 p refs Presented at the Pressure vessels and Piping-Mater.-Nucl. Conf., Miami Beach, 24 Jun. 1974
(Contract AT(11-1)-3045)
(Conf-740606-3) Avail: NTIS HC $4.25

Approximate solutions are given for the inelastic and creep buckling loads of circular cylinders under axial compression, bending, and torsion. Interaction equations are also given for various combinations of these loads. The inelastic solutions are based on small deformation-type stress-strain laws, stress and strain intensities defined by the octahedral-shear law, and the no-strain reversal model of buckling. The creep buckling solutions are obtained using isochronous stress-strain curves to approximate time dependent behavior. Based on the Rabotnov-Shesterikov stability criterion for the buckling of perfect shells, the method essentially replaces the time dependent problem with an equivalent time independent problem which is readily solvable. The simplicity of the solutions makes them well-suited for use in preliminary design analysis. Author (NSA)

N74-34379# Tennessee Univ., Knoxville.
STRESS ANALYSIS OF A RADIAL NOZZLE ATTACHED TO A CYLINDRICAL SHELL UNDER INTERNAL PRESSURE
A. J. Edmondson [1974] 35 p refs Presented at the Pressure Vessels and Piping-Mater.-Nucl. Conf., Miami Beach, 24 Jun. 1974 Sponsored by AEC
(Conf-740606-4) Avail: NTIS HC $4.75

An analytical method for the determination of stresses in the region of intersection of a thin-walled composite shell made from two right circular cylinders intersecting with axes perpendicular and subjected to internal pressure is presented. The governing equations are based on shallow, thin-shell theory and are limited to a ratio of cylinder radii of one-third or less. The formulations are written in terms of dimensionless groups to facilitate use of the analysis method in conducting parameter studies. Comparisons are made between the results obtained using the method and experimental data. The results of this investigation indicate that the analysis should prove to be a useful tool for conducting parametric studies within the specified range of validity. Author (NSA)

N74-34380# Oak Ridge National Lab., Tenn.
J INTEGRAL ANALYSIS FOR THE COMPACT SPECIMEN, CONSIDERING AXIAL FORCE AS WELL AS BENDING EFFECTS
J. G. Merkle and H. T. Corten 1973 35 p refs Presented at the Pressure Vessels and Piping-Materials-Nucl. Conf., Miami Beach, Fla., 24 Jun. 1974 Sponsored by AEC Prepared in cooperation with Illinois Univ., Urbana
(Conf-740606-15) Avail: NTIS HC $4.75

An important fracture mechanics problem is the determination of fracture toughness values with small specimens that fail after yielding. The J integral has an explicit meaning in terms of notch tip conditions in the plastic range and can be calculated from single specimen test data. An improved J integral analysis is developed for the compact specimen by considering the combined loading that exists on the net section. The analysis agrees with linear elastic fracture mechanics in the elastic range and gives a result close to that given by the equivalent energy method in the plastic range. Author (NSA)

N74-34381# Argonne National Lab., Ill.
EVALUATION OF A CLASS OF METHODS FOR BOUNDING STEADY-STATE CREEP DEFORMATION
J. J. Carey and R. A. Valentin Feb. 1974 45 p refs
(Contract W-31-109-eng-38)
(ANL-8016) Avail: NTIS HC $4.00

Theorems, due to Martin and Palmer, for bounding steady-state creep deformation are evaluated. Upper and lower bounds on the displacement rate at any point on the surface of a structure undergoing steady creep are determined in terms of arbitrary equilibrated stress distributions, and arbitrary consistent velocity fields. The theorems are applied to several problems for which exact solutions are known in order to assess the accuracy of the bounds based on a particular stress or velocity field. A procedure utilizing elastic finite-element analysis to compute the bounds is described, together with an example. Author (NSA)

N74-34382# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
LARGE DEFLECTION ELASTIC-PLASTIC DYNAMIC RESPONSE OF STIFFENED SHELLS OF REVOLUTION
J. A. Stricklin, W. E. Haisler, and W. A. VonRiesemann (Sandia Labs., Albuquerque, N. Mex.) 1974 65 p refs Presented at ASME Pressure Vessels and Piping Div. Conf., Miami, Fla., 24-28 Jun. 1974 Sponsored by AEC
(SLA-73-7049) Avail: NTIS HC $6.25

The formulation and check out problems for a computer code DYNAPLAS, which analyzes the large deflection elastic-plastic dynamic response of stiffened shells of revolution are given. The formulation for spacial discretization is by the finite element method with finite differences being used for the evaluation of the pseudo forces due to material and geometric nonlinearities. Time integration is by the Houbolt method or central

differences. The stiffeners may be due to concentrated or distributed eccentric rings and spring supports at arbitrary angles around the circumference of the elements. Check out problems include the comparison of solutions from DYNAPLAS with experimental and other computer solutions for rings and conical and cylindrical shells. A hypothetical submarine including stiffeners and missile tube is studied under a combination of hydrostatic and dynamically applied asymmetrical pressure loadings.
Author (NSA)

N74-34383# California Univ., Livermore. Lawrence Livermore Lab.
NONLINEAR DYNAMIC ANALYSIS OF AXISYMMETRIC SOLIDS BY THE FINITE ELEMENT METHOD
M. Hartzman 31 Jul. 1973 27 p refs Presented at Pressure Vessels and Piping-Materials-Nuclear Conf., Miami Beach, Fla., 24-28 June. 1974 Sponsored by AEC
(UCRL-74978; Conf-740606-2) Avail: NTIS HC $3.50

A method for calculating the dynamic response of deformable axisymmetric solids, subjected to time-dependent axisymmetric loads is described. The nonlinearities considered in this analysis include material nonlinearity (elastic-plastic behavior) and geometric nonlinearity, which includes finite deformation. The finite element method is applied to approximate the continuum by a lumped-mass system connected by axisymmetric elements. The equations of motion are solved by applying a step-by-step numerical technique. The analysis is illustrated by application to the collapse of a built-in spherical dome with varying thickness and to the impact of a cylinder against a rigid wall.
Author (NSA)

N74-34384# California Univ., Livermore. Lawrence Livermore Lab.
ELFED: A COMPUTER CODE TO GENERATE FINITE ELEMENT MESH FOR PROBLEMS OF COMPLEX AXI-SYMMETRIC GEOMETRY
D. A. Schauer 3 Dec. 1973 19 p Presented at Pressure Vessels and Piping-Materials-Nuclear Conf., Miami Beach, Fla., 24-28 Jun. 1974
(Contract W-7405-eng-48)
(UCRL-74879; Conf-740606-14) Avail: NTIS HC $4.00

ELFED is a computer program used to define a finite element network of complex description. ELFED can properly zone any body of revolution. First, the region of interest is divided into areas which may consist of a common material. The boundaries of these areas are called parts, and they are required ELFED input. Each part is then subdivided by ELFED into elements composed of three or four nodal points. After the geometry is completely specified, the user indicates how the defined parts are to be connected. Finally, ELFED numbers the nodes and elements in the manner specified to complete a finite element mesh.
Author (NSA)

N74-34385# California Univ., Livermore. Lawrence Livermore Lab.
NUMERICAL COMPUTATION OF DYNAMIC STRESS INTENSITY FACTORS BY A LAGRANGIAN FINITE-DIFFERENCE METHOD (THE HEMP CODE)
Y. M. Chen 2 Apr. 1974 11 p refs
(Contract W-7405-eng-48)
(UCRL-51563) Avail: NTIS HC $4.00

Numerical computation of the dynamic stress intensity factor for a centrally cracked rectangular bar, subjected to uniaxial tensions in plane strain geometry with Heaviside-function time dependence, is carried out using the time dependent Lagrangian finite difference code, HEMP. Excellent agreement was found with results obtained from other methods. This demonstrates the capability and the reliability of the HEMP code as an extremely useful numerical method for solving dynamic problems in fracture mechanics. Also discussed is the dynamic behavior of the stress intensity factor and crack opening.
Author (NSA)

N74-34386# California Univ., Berkeley. Lawrence Berkeley Lab.
UNIAXIAL BEND STRENGTH AND FRACTURE INITIATION ENERGY IN GLASS-ALUMINA COMPOSITES M.S. Thesis
D. R. Biswas 27 Feb. 1974 32 p refs
(Contract W-7405-eng-48)
(LBL-2566) Avail: NTIS HC $4.75

Uniaxial bend strength and fracture initiation energy of a glass-alumina composite system are measured by 4-point bending and double-cantilever-beam methods. The composites were fabricated by vacuum hotpressing technique. The second phase alumina particles increase the strength and the load necessary for failure in the double cantilever test. The two test methods are discussed making the assumption that the presence of microflaws introduced by diamond saving at the crack tip of the double-cantilever-beam specimen leads to the similar stress at the point of fracture. The tendency of fine alumina particles to agglomerate reduces the strength of the composite approximately 15% from that without agglomeration.
Author

N74-34387# Naval Intelligence Support Center, Washington, D.C. Translation Div.
DETERMINATION OF STRESSES IN A CYLINDRICAL SHELL WITH AN ELLIPTIC APERTURE
S. V. Zakora, V. N. Chekhov, and Yu. A. Shevlyakov 11 Feb. 1974 9 p refs Transl. into ENGLISH from Tr. Nikolaev Shipbuilding Inst. (USSR), no. 56, 1972 p 22-26
(AD-780559; NISC-Trans-3513) Avail: NTIS CSCL 20/11

The distribution of stresses at a large elliptic aperture located on the lateral surface of a circular cylindrical shell was studied in previous papers where it is assumed that the shape of the aperture differs only little from the circle on the evolute of a cylinder. To eliminate this restriction, an alternative method of numerical determination of stresses in a shell with curvilinear aperture was proposed in yet another paper. In the present paper, this method is applied to the case of an elliptical aperture. GRA

N74-34388# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
BEHAVIOR OF CYLINDRICAL PANELS AND SHELLS UNDER THE EFFECT OF AN INCIDENT COMPRESSION WAVE
E. D. Skurlatov 17 Jun. 1974 13 p refs Transl. into ENGLISH from Tr. Teorii Plastin i Obolochek, Kazan (USSR), 1971 p 256-261
(AD-781617; FTD-HT-23-1108-74) Avail: NTIS CSCL 20/11

Tests were conducted to determine the effects of shock waves on the structural stability of cylindrical shells and plates. The condition under investigation consists of a cylindrical panel hinged at the edges that is compressed or stretched in the longitudinal direction and under the effect of a compressive wave propagating in the direction of the generatrix. Computations were made for square panels which have a different curvature and thickness. Also varied were the rate of movement of the shock wave front, pressure at the front, the law of pressure drop behind the front, the axial stresses, and the amount of damping.
Author

N74-34389# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE NONLINEAR DYNAMICS OF PLATES AND SHELLS
A. S. Volmir 16 Apr. 1974 544 p refs Transl. into ENGLISH of the book "Nelineinaya Dinamika Plastinok i Obolochek" Moscow, 1972 432 p
(AD-781338; FTD-HC-23-851-74) Avail: NTIS CSCL 20/1

The book consists of ten chapters. Chapter I contains the fundamental equations of dynamic theory of large-deflection plates and shells. Chapters II-V examine the various types of vibratory motions of plates and shells. Specific problems pertaining to natural and forced vibrations are apparently presented here for the first time. In the section pertaining to self-induced vibrations, principal attention is given to new data on panel flutter. Chapters VI-IX describe the behavior of thin-walled systems under dynamic loading. It includes an analysis of deformation of plates and shells under rapid and very rapid impact loads of different types. Finally, Chapter X presents some problems of shell and plate dynamics requiring a statistical approach. GRA

N74-34390# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
VIBRATION TESTING Final Report
4 Mar. 1974 43 p refs Supersedes MTP-2-1-003
(AD-781517; TOP-1-1-050; MTP-2-1-003) Avail: NTIS CSCL 15/5

The report provides background information on the theory and principles of laboratory vibration testing to simulate field vibration environments. It discusses test item structural considerations, data acquisition and interpretation, sinusoidal and complex motion type vibration schedules, vehicle behavior, and vibration test equipment and instrumentation. It applies to most Army materiel and transportation modes. The report does not cover shock, except as interrelated to the field environment, and does not provide vibration test schedules. Author (GRA)

N74-34391# Lockheed Missiles and Space Co., Sunnyvale, Calif.
VARIABLE GRID FINITE DIFFERENCE-ELEMENT SOLUTION OF ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS Interim Report
Paul S. Jensen and Carlos A. Felippa 13 May 1974 56 p refs
(Contract F44620-71-C-0109; AF Proj. 9749)
(AD-782301; LMSC-D401891; AFOSR-74-1036TR) Avail: NTIS CSCL 20/11

A hybrid finite difference-finite element technique for elliptic partial differential equations, which operates on arbitrary discretization grids, is formulated. The technique has been implemented, and extensive results are given for the biharmonic equation. Author (GRA)

N74-34392# Syracuse Univ., N.Y. Dept. of Mechanical and Aerospace Engineering.
THEORETICAL STRESS AND STIFFNESS DATA FOR DISCRETELY ATTACHED CORRUGATED SHEAR WEBS WITH CURVILINEAR CORRUGATIONS
Lung-Hsiang Wu and Charles Libove May 1974 67 p refs (Grant NSF GK-35814)
(PB-232965/4; MAE-5170-T2) Avail: NTIS HC $3.75 CSCL 13M

Theoretical numerical data are presented for the shear stiffness of corrugated shear webs with discrete attachments to framing members at the ends of the corrugations, and for the maximum transverse extreme-fiber flexural strains due to the cross-sectional deformations which arise during the shearing of such webs. The corrugation cross section is curvilinear with crests and troughs composed of identical circular arcs. Four kinds of discrete attachments are considered at the ends of the corrugations, namely (a) point attachments in the troughs, (b) point attachments in the troughs and at the crests, (c) point attachments at mid-height, and (d) point attachments in the troughs, at the crests, and at mid-height. The material is taken to be linearly elastic and isotropic. GRA

N74-34393# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PULLOUT RESISTANCE OF REINFORCING BARS EMBEDDED IN HARDENED CONCRETE Final Report
Richard L. Stowe Jun. 1974 42 p refs
(AD-781972; AEWES-Misc-Paper-C-74-12) Avail: NTIS CSCL 13/3

Holes for embedding reinforcing bars were diamond-drilled into mass concrete test blocks. The holes were 1 in. (25.4 mm) in diameter and deep enough to embed No. 4 and No. 6 deformed reinforcing bars to depths of 5, 8, 10, and 20 nominal bar diameters. Portland-cement grouts and commercially available epoxy-resin systems were used to anchor the bars in the drilled holes. Bonding agents were allowed to cure, and the reinforcing bars were axially loaded to determine which bonding agent offered the most pullout resistance. In all instances, the epoxy-anchored reinforcing bars exhibited more resistance to pullout than did the bars anchored with the cement grouts. The bonding agents evaluated in this investigation are recommended for anchoring reinforcing bars in drilled holes in hardened mass concrete; however, certain limitations are specified for their use. Author (GRA)

N74-34394# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
ON STEADY QUASI-STATIC CRACK GROWTH Interim Report
John W. Hutchinson Apr. 1974 30 p refs
(Grants AF-AFOSR-2476-73; DAHC15-73-G-16; AF Proj. 6813)
(AD-782486; DEAP-S-8; AFOSR-74-1042TR) Avail: NTIS CSCL 20/12

Aspects of crack growth in an elastic-plastic material under quasi-static, steady conditions are investigated for plane problems. A path-independent line integral is identified for the steady problem which generalizes the J-integral of deformation theory plasticity to incremental theories of plasticity. Implications of the integral for small scale yielding crack growth are discussed. A model study is made of the effect on the growth process of the residual plastic wake left behind the advancing crack. The influence of the wake on the stabilization of crack growth is discussed. Author (GRA)

N74-34395# Harry Diamond Labs., Washington, D.C.
THE DYNAMIC RESPONSE OF ALUMINUM TO PULSED ENERGY DEPOSITION IN THE MELT-DOMINATED REGIME
Robert B. Oswald, Jr., Flynn B. McLean, Dale R. Schallhorn, and Timothy R. Oldham Jul. 1973 40 p refs
(DA Proj. 1B0-62113-A-661)
(AD-781978; HDL-TR-1624) Avail: NTIS CSCL 20/12

The results of an experimental study of the material dynamic response of aluminum exposed to a high-fluence, low-energy, pulsed electron beam are presented. The experimental results are compared with calculations based on two equilibrium equation of state (EOS) models for metals in the melt regime. The first model is the simple Mie-Gruneisen (M-G) scheme for solids extrapolated into the liquid phase. The second model (the GRAY EOS) is a three-phase EOS which provides a more detailed and thermodynamically complete description of metals in the melt region. After the onset of melting the M-G theory differs appreciably from experiment, whereas the GRAY EOS provides good agreement. The results indicate that the P-V-T relationship during the melting process can be described by an equilibrium--but thermodynamically consistent--EOS model. (Modified author abstract) GRA

N74-34396# Army Missile Command, Redstone Arsenal, Ala. Ground Equipment and Materials Directorate.
ANALYSIS OF AN AXISYMMETRIC ORTHOTROPIC SHELL OF REVOLUTION WITH TRANSVERSE SHEAR DEFORMATIONS
Charles M. Eldridge and Ju-Chin Huang 20 May 1974 52 p refs
(DA Proj. 1E7-62708-A-090)
(AD-781976; RL-TR-74-9) Avail: NTIS CSCL 16/4

A straight-line element is used to analyze an axisymmetric, orthotropic shell of revolution by the finite element method. Shear deformations are included. The element stiffness relations were obtained from the well-known principle of minimum potential energy. A computer program to implement the solution and the instructions for its usage are also reported. Example problems illustrating accuracy and usage are included. Author (GRA)

N74-34397# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
STRAIN ENERGY DENSITY CRITERION APPLIED TO CRACK AND NOTCH PROBLEMS
G. C. Sih Jun. 1974 18 p refs
(Grant AF-AFOSR-2586-74; AF Proj. 9782)
(AD-782014; AFOSR-74-1044TR) Avail: NTIS CSCL 20/12

One of the most important purposes of the application of the strain energy density theory was to join the behavior of cracks to that of notches. This has essentially been accomplished through the addition of another constant, a length parameter. By specifying the failure to occur at an interior element of the material, the local singular behavior of the line crack is avoided, hence disposing of a barrier that has separated notch and crack failure theories. Another important result was the description of the phenomenon of post-fracture behavior. The local behavior has been shown to agree well with observable details of crack paths emanating from a notch tip. GRA

N74-34398# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PLATE CALCULATION WITH PLASTICITY AND CREEP CONSIDERED, CHAPTER 19
L. M. Kachanov 17 Jun. 1974 25 p refs Transl. into ENGLISH

from Prochnost i Ustoichivost-Kolebaniya (USSR), V. 1, 1968 p 615-628
(AD-782070; FTD-HT-23-1007-74) Avail: NTIS CSCL 20/11

The theory of plate bending beyond elastic limits is discussed to show the three geometric concepts involved. It is stated that calculations based on these concepts lead to satisfactory results for plates of average thickness. Formulas for determining the limiting loads for plates are tabulated. Mathematical models are developed to prove the conditions for ideal plastic plates under various conditions. The performance of bent plates in the presence of creep flow is analyzed. Author

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N74-34399+ National Aeronautical Lab., Bangalore (India). Information Centre for Aeronautics.
KINETIC HEATING AND THERMAL STRESS PROBLEMS, JANUARY 1968 - JUNE 1973
Mar. 1974 27 p refs
(NAL-Bibl-Ser-56) Avail: NTIS HC $4.50

This bibliography covers problems relating to aircraft and aerospace structures, such as rockets, reentry vehicles, space vehicles and satellites at supersonic speeds. The period of coverage was from Jan. 1968 to Jun. 1973. Different types of documents such as books, conference proceedings, patents, report literature and journal articles are included. Author

N74-34400*# Grumman Aerospace Corp., Bethpage, N.Y.
THERMAL-STRUCTURAL EVALUATION OF TD Ni-20Cr THERMAL PROTECTION SYSTEM PANELS
H. L. Eidinoff and L. Rose Jun. 1974 85 p refs
(Contract NAS1-12277)
(NASA-CR-132487) Avail: NTIS HC $4.00 CSCL 20M

The results of a thermal-structural test program to verify the performance of a metallic/radiative Thermal Protection System (TPS) under reentry conditions are presented. This TPS panel is suitable for multiple reentry, high L/D space vehicles, such as the NASA space shuttle, having surface temperatures up to 1200 C (2200 F). The TPS panel tested consists of a corrugation-stiffened, beaded-skin TD Ni-20Cr metallic heat shield backed by a flexible fibrous quartz and radiative shield insulative system. Test conditions simulated the critical heating and aerodynamic pressure environments expected during 100 repeated missions of a reentry vehicle. Temperatures were measured during each reentry cycle; heat-shield flatness surveys to measure permanent set of the metallic components were made every 10 cycles. The TPS panel, in spite of localized surface failures, performed its designated function. Author

N74-34401*# Grumman Aerospace Corp., Bethpage, N.Y.
LATERAL CONDUCTION EFFECTS ON HEAT-TRANSFER DATA OBTAINED WITH THE PHASE-CHANGE PAINT TECHNIQUE Final Report
George Maise and Michael J. Rossi Washington NASA Aug. 1974 151 p refs
(Contract NAS1-11818)
(NASA-CR-2435) Avail: NTIS HC $5.00 CSCL 20M

A computerized tool, CAPE, (Conduction Analysis Program using Eigenvalues) has been developed to account for lateral heat conduction in wind tunnel models in the data reduction of the phase-change paint technique. The tool also accounts for the effects of finite thickness (thin wings) and surface curvature. A special reduction procedure using just one time of melt is also possible on leading edges. A novel iterative numerical scheme was used, with discretized spatial coordinates but analytic integration in time, to solve the inverse conduction problem involved in the data reduction. A yes-no chart is provided which tells the test engineer when various corrections are large enough so that CAPE should be used. The accuracy of the phase-change paint technique in the presence of finite thickness and lateral conduction is also investigated. Author

N74-34402*# Dynatherm Corp., Cockeysville, Md.
HEAT PIPE DESIGN HANDBOOK, PART 2
E. A. Skrabek Aug. 1972 150 p refs
(Contract NAS9-11927)
(NASA-CR-134265; DTM72-3-Pt-2) Avail: NTIS HC $10.50 CSCL 20M

The utilization of a digital computer code for heat pipe analysis and design (HPAD) is described which calculates the steady state hydrodynamic heat transport capability of a heat pipe with a particular wick configuration, the working fluid being a function of wick cross-sectional area. Heat load, orientation, operating temperature, and heat pipe geometry are specified. Both one 'g' and zero 'g' environments are considered, and, at the user's option, the code will also perform a weight analysis and will calculate heat pipe temperature drops. The central porous slab, circumferential porous wick, arterial wick, annular wick, and axial rectangular grooves are the wick configurations which HPAD has the capability of analyzing. For Vol. 1, see N74-22569. Author

N74-34403*# Aerotherm Corp., Mountain View, Calif.
USER'S MANUAL FOR RAD/EQUIL/1973: A GENERAL PURPOSE RADIATION TRANSPORT PROGRAM
W. E. Nicolet Nov. 1973 204 p refs
(Contract NAS1-12160)
(NASA-CR-132470; Aerotherm-UM-73-43) Avail: NTIS HC $5.75 CSCL 20M

A procedure is described for implementing the RAD/EQUIL/1973 program, and instructions are given which allow the program input to be prepared, the output to be interpreted, the operating procedures identified which must be followed, and the meaning of the error messages to be understood. The structure of the program is described through a verbal description, a FORTRAN variables list, and a listing of the program. Author

N74-34404# Sandia Labs., Albuquerque, N.Mex.
TRANSIENT FORCED CONVECTION DURING DUAL CHAMBER COMBUSTION
C. S. Landram and D. L. Hartley Jan. 1974 66 p Presented at a Symp. on the Fluid Mech. of Combust., Montreal, Quebec, Can., 13 May 1974
(Contract AT(29-1)-789)
(SLL-73-74; Conf-740514-1) Avail: NTIS HC $6.50

The forced convective heat transfer within a charged spherical combustion chamber was measured and identified in terms of the flow field during and following gas injection. Flow field decay within the chamber occurs long after injection has ceased. Only minor spatial variations in the wall heat flux were noted. From an analytical model of the flow field, a semi-empirical temporal heat transfer conductance in the charged chamber was inferred and was tested for differing initial chamber pressure ratios and for differing gases. Author

N74-34405# Oak Ridge National Lab., Tenn.
COOLING SYSTEMS: TOWERS, PONDS, AND ONCE-THROUGH COOLING
Z. Combs, comp., E. E. Huber, comp., and B. C. Talmi, comp. May 1974 127 p refs
(Contract W-7405-eng-26)
(ORNL-EIS-74-66) Avail: NTIS HC $9.50

A bibliography is presented of 406 references on cooling systems. Information is included on cooling lakes and reservoirs, meteorology, environmental effects, economics, design criteria, water supplies, and hydrodynamics. Corporate and individual author indexes and a permuted title index are provided.
Author (NSA)

N74-34406# Los Alamos Scientific Lab., N.Mex.
POOL BOILING HEAT TRANSFER TO LIQUID HELIUM AND LIQUID NITROGEN IN A NEARLY ZERO GRAVITY ENVIRONMENT
F. J. Edeskuty, K. D. Williamson, and J. F. Taylor 1973 14 p refs Presented at 5th Intern. Cryogenic Eng. Conf., Kyoto, Japan, 7 May 1974 Sponsored by AEC
(LA-UR-74-680; Conf-740509-4) Avail: NTIS HC $4.00

A rocket-borne experiment was designed to obtain steady data on nucleate boiling heat transfer to liquid helium and liquid nitrogen in a nearly zero gravity environment. The experiment was successfully launched and was maintained at nearly zero gravity for five and one-half minutes, and the peak nucleate heat flux was reduced below the 1 g value. The results obtained are presented. Author (NSA)

N74-34407# California Univ., Livermore. Lawrence Livermore Lab.
ESTIMATION OF DIFFUSION COEFFICIENTS AT HIGH TEMPERATURES AND PRESSURES
D. G. Miller 21 Mar. 1974 25 p refs
(Contract W-7405-eng-48)
(UCRL-51546) Avail: NTIS HC $4.00

Energy release in heterogenous explosives appears to be diffusion controlled, and an so examination of how well kinetic theories might predict diffusion coefficients in the region of 1500 K to 3000 K and 50 kbar to 200 kbar was undertaken to provide diffusion data for that process. Estimation procedures and comparisons with molecular dynamics calculation are reviewed. The Leonard-Jones potential with a temperature correction, and the Enskog correction using the Carnahan-Starling hardsphere equation of state were found to give the fairest estimates (within 50 percent at moderate pressures and 100 percent at higher pressures). The procedure described leads to an analytical equation that can be used in computer programs. Author

N74-34408# Naval Postgraduate School, Monterey, Calif.
SCHLIEREN STUDY OF COMPOSITE PROPELLANT COMBUSTION M.S. Thesis
Robert Ross Gerhardt Mar. 1974 32 p refs
(AD-781343) Avail: NTIS CSCL 21/2

A photographic investigation of metallized and non-metallized composite solid propellant combustion was made. Propellant strands made from large unimodal AP and PBAN binder, both with and without aluminum powder, were burned in a conventional stainless steel combustion bomb. High speed color schlieren motion pictures were taken of the combustion process to determine the effects of pressure and strand thickness on propellant deflagration. Results are discussed and compared with data on AP/binder sandwich experiments. Author (GRA)

N74-34409# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COLD BY VORTICITY
Kuibyshev 19 Jun. 1974 4 p Transl. into ENGLISH from Sots. Industriya (USSR), no. 279, 29 Nov. 1973 p 4
(AD-781312; FTD-HT-23-1558-74) Avail: NTIS CSCL 13/1

A miniature low-temperature refrigerating unit is described which can be used in many different spheres of industry. It is based upon the vortex effect of the energy fractionation of compressed gas and is capable of cooling small cylindrical bodies. The unit is useful to oil-industry workers for the continuous monitoring of the solidification of petroleum products; with it one can investigate the properties of materials at low temperatures in plant laboratories. In the new unit it is possible to cool separate elements of the circuits of radio-electronic instruments and cylindrical active bodies of lasers. Upon switching it on, a temperature of minus 100 degrees is reached in less than one minute. GRA

N74-34410# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FORMATION OF A SHOCK WAVE AHEAD OF A FLAME FRONT
G. D. Salamandra 18 Jun. 1974 15 p refs Transl. into ENGLISH from the book "Teplofizicheskie Svoistva i Gazodinamika Vysokotemperaturnykh Sred" USSR, 1972 p 130-135
(AD-781671; FTD-HT-23-1157-74) Avail: NTIS CSCL 21/2

An investigation of the formation of a shock wave ahead of a flame front is of interest since the formation of the shock wave is accompanied by the production of a region in front of the combustion zone in which the state of the gas differs to a significant degree from that in an undisturbed mixture. This fact must be taken into consideration when solving a number of questions connected with shock wave - flame front interaction. GRA

N74-34411# Calspan Corp., Buffalo, N.Y.
EXPERIMENTAL INVESTIGATION OF ROCKET PLUME RADIATION AT LOW ALTITUDES Midterm Technical Report, Mar. - May 1974
W. H. Wurster and D. Boyer 1 Jun. 1974 48 p refs
(Contract DAAH01-74-C-0599; ARPA Order 2656)
(AD-782263; CALSPAN-KC-5478-A-1) Avail: NTIS CSCL 21/2

The report is a midterm technical report on a research program currently underway at Calspan on the experimental investigation of rocket plume radiation at low altitudes. The objectives of the program include the study of plume structure, gasdynamics and chemistry associated with the interaction of the plume with the ambient atmosphere. The experimental facilities, techniques and diagnostics are described in detail. The overall system as applied to this program is presently operational and undergoing initial checkout tests. The overall test parameter matrix in terms of rocket motor configuration, propellant mixtures, altitudes and ambient gas conditions is presented. (Modified author abstract) GRA

N74-34412# Army Foreign Science and Technology Center, Charlottesville, Va.
INTENSIFICATION OF CONVECTIVE HEAT EXCHANGE UNDER THE EFFECT OF ARTIFICIAL ROUGHNESS
V. I. Gomelauri, R. D. Kandelaki, and N. E. Kipshidze 26 Mar. 1974 27 p Transl. into ENGLISH from the book "Metsniereba Tbilisi" USSR, 1970 p 98-131
(AD-782087; FSTC-HT-23-339-73) Avail: NTIS CSCL 20/13

A physical model of the phenomenon of intensification of heat exchange under the effect of two-dimensional artificial roughness is proposed and conclusions about the basic characteristics of this phenomenon are drawn on the basis of the corresponding analysis. A technique for experimental study of the phenomenon is outlined, the experimental set-up is described and the test data as well as the results of their processing are given. GRA

N74-34413# Purdue Univ., Lafayette, Ind. Project Squid Headquarters.
FLAMMABILITY LIMITS AND THE OSCILLATORY BURNING OF SOLID PROPELLANTS AT LOW PRESSURE
Bantwal Rabindranath Baliga (Case Western Univ.) and James S. Tien (Case Western Univ.) Jun. 1974 38 p refs
(Contract N00014-67-A-0226-0005; NR Proj. 098-038; Proj. Squid)
(AD-782561; SQUID-TR-CWRU-1-PU) Avail: NTIS CSCL 21/2

A one-dimensional analysis of the small-amplitude oscillatory burning of a solid propellant has been developed. The analysis is based on a simplified flame model using quasi-steady gas-phase approximation. The difference between this analysis and previous analyses is that radiant heat loss from the burning surface has been included in the present theory. This heat loss produces significant qualitative and quantitative differences in the unsteady behaviour of solid propellants at low pressures. The effect of initial temperature on the stability of the combustion process has also been examined. (Modified author abstract) GRA

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N74-34414# National Research Council of Canada, Ottawa (Ontario).
QUARTERLY BULLETIN OF THE DIVISION OF MECHANICAL ENGINEERING AND THE NATIONAL AERONAUTICAL ESTABLISHMENT, 1 APRIL - 30 JUNE 1974
30 Jun. 1974 78 p refs

(DME/NAE-1974(2)) Avail: NTIS HC $7.00
A review of the interests and current activities of the Division of Mechanical Engineering and the National Aeronautical Establishment of the National Research Council of Canada (NRC) presents information on research performed on vertical axis wind turbines, variable geometry compressors for automotive gas turbines, and clinical treatment and wound repair with the application of electromagnetic fields. A record of current activities of individual laboratories within the two divisions is also provided, along with a list of technical reports, and miscellaneous papers published under the auspices of NRC. For individual titles, see N74-34415 through N74-34417.

N74-34415 National Aeronautical Establishment, Ottawa (Ontario). Low Speed Aerodynamics Lab.
WIND POWER AND THE VERTICAL AXIS WIND TURBINE DEVELOPED AT THE NATIONAL RESEARCH COUNCIL **c03**
R. S. Rangi, P. South, and R. J. Templin *In* NRS Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 30 Jun. 1974 p 1-14 refs (For availability see N74-34414 23-34)
A map with contours of the estimated wind power available in Canada was prepared which shows large areas with high power potential. A comparison of wind energy cost with alternate sources indicates that the capital cost of current wind machines has to be reduced considerably in order to make wind power competitive with existing sources. The design features, performance, and economics of a vertical-axis wind turbine are described, and the case is made that considerable capital cost savings are possible with the design. Author

N74-34416 National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
PROSPECTS FOR VARIABLE GEOMETRY COMPRESSORS IN AUTOMOTIVE GAS TURBINES **c28**
G. M. Shulhan *In its* Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 30 Jun. 1974 p 15-24 refs (For availability see N74-34414 23-34)
The two basic approaches in designing a vehicular gas turbine power plant (that of using a low pressure ratio cycle with heat exchange, and that of using a high pressure ratio cycle without heat exchange) are described in preface to a discussion of a method of improving part load performance of a low pressure ratio regenerative cycle with variable geometry power turbine nozzles and power transfer. The power transfer concept is explained and illustrated, and the effect of variable geometry turbines on running line is shown on a compressor performance diagram. Variable geometry at the cold end of the low pressure ratio regenerative cycle is offered as an alternative solution, and a performance assessment of the variable geometry compressor cycle is provided. A.A.D.

N74-34417 National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
ELECTROMAGNETIC FIELDS AND WOUND REPAIR **c04**
C. Romero-Sierra (Queen's Univ., Kingston, Ontario), S. Halter (Queen's Univ., Kingston, Ontario), and J. A. Tanner *In its* Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 30 Jun. 1974 p 25-34 refs (For availability see N74-34414 23-34)
Experiments were conducted to compare the effect on wound healing of treatment with saline, or histamine diphosphate alone, or combined with the application of electromagnetic (EM) fields. Surgical incisions in the skin of the dorsum of 240 rats were treated with either saline or histamine. One-half of the animals treated with each chemical were exposed to a VHF (27 MHz) EM field for 15 minutes. Histamine treatment in conjunction with EM field exposure proved most efficient in improving wound healing (rate of healing, efficiency, minimized scar tissue). Saline treatment plus EM field exposure, histamine alone, and saline alone were successively less effective. The medical efficacy of EM field treatment is demonstrated, and it is noted that the greatest effect occurs within 12 hours of treatment. Author

N74-34418# Committee on Aeronautical and Space Sciences (U. S. Senate).
SEVENTH APPLICATIONS TECHNOLOGY SATELLITE
Washington GPO 1974 98 p refs Hearing on S. 3542 before Comm. on Aeron. and Space Sci., 93d Congr., 2d Sess., 23 Jul. 1974
(GPO-37-846) Avail: SOD HC $1.20
A bill to authorize appropriations to the NASA administration for research and development of ATS 7 is considered. G.G.

N74-34419# Committee on Science and Astronautics (U. S. House).
INTERNATIONAL SCIENCE AND TECHNOLOGY TRANSFER ACT OF 1974
Washington GPO 1974 174 p refs Hearings before Subcomm. on Intern. Cooperation in Sci. and Space of the Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., no. 37, 21-23 May 1974
(GPO-35-283) Avail: Subcomm. on Intern. Cooperation in Sci. and Space
Technology transfer legislation for international cooperation is considered with emphasis on telecommunication, solar energy conversion, and earth resources observation systems. G.G.

N74-34420# Commerce Dept., Washington, D.C.
ANNUAL REPORT OF THE SECRETARY OF COMMERCE, FISCAL YEAR ENDING 30 JUNE 1973
14 Mar. 1974 94 p
Avail: SOD HC $1.30
The finances and activities of the Department of Commerce are outlined. Reported are managerial details, economic and scientific developments for industry and business, and ocean shipping data. G.G.

N74-34421# Committee on Public Works (U. S. Senate).
RESOURCE CONSERVATION, RESOURCE RECOVERY, AND SOLID WASTE DISPOSAL
Washington GPO Nov. 1973 316 p refs Presented by the Environ. Policy Div. of the Congressional Res. Service, Library of Congr. to the Comm. on Public Works, 93d Congr., 1st Sess., 25 Oct. 1973 Prepared by Library of Congress
(GPO-23-615) Avail: Comm. on Public Works
Integrated future solid waste management programs are considered for their relations to resource conservation, materials flow through the economy, and to questions concerning the future quality of life. The basis on which conflicting projections of mineral resources rest is identified, economic forces affecting materials flow and recycling are described, factors affecting durability of mechanical consumer products are outlined, and major recent reports relating to materials policy are reviewed. G.G.

N74-34422# Committee on Labor and Public Welfare (U. S. Senate).
EFFECTS OF THE ENERGY CRISIS ON THE HEALTH CARE SYSTEM, 1973
Washington GPO 1974 119 p refs Hearings before the Subcomm. on Health of the Comm. on Labor and Public Welfare, 93d Congr., 1st Sess., 17 Dec. 1973
(GPO-28-057) Avail: Subcomm. on Health
A Congressional hearing was conducted to determine the effects of the oil shortage on the health care systems of the Nation. Testimony was submitted by representatives of the medical companies, drug manufacturers, hospital managers, and fuel producers. The shortages of drugs and medical supplies which are caused by the fuel shortage are identified. Several proposals for improving the situation are submitted. Author

N74-34423# Committee on the Judiciary (U. S. Senate).
COMPETITION IN THE ENERGY INDUSTRY
Washington GPO 1974 408 p refs Hearings before Subcomm. on Antitrust and Monopoly of the Comm. on the Judiciary (Pursuant to S. Res. 56, Section 4, Gasoline and Fuel Oil), 93d Congr., 1st Sess., 8, 11 and 12 Jun.; 11 and 27 Jul. 1973
(GPO-24-334) Avail: SOD HC $3.00
A Congressional investigation was conducted to determine the situation within the petroleum industry and the competition which exists between various segments of the gasoline and fuel oil production facilities. Testimony was submitted by selected representatives of the industries involved to show the manner of operation and the impact of the oil crisis. Examples of legislation to control and promote improvements in the gasoline and fuel oil industries are provided. Projections concerning

increasing energy requirements and possible areas of shortage are analyzed. Author

N74-34424# Advisory Group for Aerospace Research and Development, Paris (France).
GLOSSARY OF DOCUMENTATION TERMS. PART 1: GENERAL TERMS
H. A. Stolk, ed. and A. H. Holloway, ed. Jul. 1974 37 p
(AGARD-AG-182-Pt-1; AGARDograph-182-Pt-1) Avail: NTIS HC $5.00

A glossary of scientific and technical terms, arranged in alphabetical order, is presented for use as a reference during documentation activities. A.A.D.

N74-34425# RAND Corp., Santa Monica, Calif.
A LOOK TO THE FUTURE
W. B. Graham Jun. 1974 11 p refs Presented at the 1st Ann. Symp. of the Natl. Assoc. of Remotely Piloted Vehicles (NARPV 1974), Wright-Patterson AFB, Ohio, 1 May 1974
(P-5251) Avail: NTIS HC $4.00

Future warfare technology changes for the Air Force constitute developments of: (1) digital computers; (2) remotely manned vehicles; (3) high power lasers; (4) electro-optical sensors and displays; (5) surface effect vehicles; (6) remote emplaced sensors; (7) high temperature and high strength materials; (8) communication satellites; (9) accurate weapon and vehicle guidance; (10) convertible aircraft; (11) real time reconnaissance; and (12) high performance chemical propulsion. G.G.

N74-34426# RAND Corp., Santa Monica, Calif.
GROWTH CONTROL: SOME QUESTIONS FOR URBAN DECISIONMAKERS
Robert A. Levine Jul. 1974 35 p refs
(Grant NSF GI-29763)
(R-1419-NSF) Avail: NTIS HC $4.75

A series of questions are considered that urban managers should ask in their attempts to control growth. The answers to these and similar questions should enable them to better understand the economic and political context in which their tools must be used and make it more feasible to achieve realistic control objectives. The consequences of growth control are primarily economic, dealing with both private economic effects and those on the public economy. Author

N74-34427# RAND Corp., Santa Monica, Calif.
THE STAR METHODOLOGY FOR SHORT-HAUL TRANSPORTATION: TRANSPORTATION SYSTEM IMPACT ASSESSMENT
L. G. Chesler and B. F. Goeller Dec. 1973 77 p refs
(Contract DOT-TSI-363)
(R-1359-DOT) Avail: NTIS HC $7.00

This is a summary of a series of nine reports documenting the STAR methodology developed for performing R and D policy analysis studies of short-haul (50 to 500 miles) passenger transportation systems. The methodology, which allows comparison of air and ground modes, was developed to help analyzed the following range of impacts for alternative transportation systems. (1) service impacts - door-to-door time and cost, passenger volumes, passengers diverted from existing facilities. (2) financial impacts - system investments, operator profit and taxes, operating costs, annual subsidy required. (3) economic impacts - changes in regional income and employment as a result of system construction. (4) community impacts - the amount of land taken, the number of households displaced, the number of households exposed to excessive noise, the amount of energy consumed, the changes in the amount of air pollution emissions. (5) social impacts - the distribution of benefits and disbenefits by social group, including the fraction of travelers in high-, medium-, and low-income groups; the proportion of business and nonbusiness travelers; the fraction of those exposed to excessive noise by race and income group. Author

N74-34428# Committee on Finance (U. S. Senate).
FISCAL POLICY AND THE ENERGY CRISIS, PART 1
Washington GPO 1973 583 p refs Hearings before the Subcomm. on Energy of Comm. on Finance, 93d Congr., 1st Sess., 27, 28 and 29 Nov. 1973
(GPO-25-047) Avail: SOD HC $4.05

The formation of a financial base for a total energy policy whose scope includes both measures for reducing present energy consumption habits, and research support for the development of new sources of energy in order to relieve the U. S. of its almost complete dependence on fossil fuel, was the subject of a series of hearings before Congress. Both public and private sector measures are discussed, including the establishment of a national energy trust fund supported by a tax on energy consumption, the creation of incentives for the production of energy by private industry, and a variable import levy on foreign energy to protect and encourage domestic investment in energy technology. A.A.D.

N74-34429# Committee on Finance (U. S. Senate).
FISCAL POLICY AND THE ENERGY CRISIS, PART 2, APPENDIXES TO PART 1
Washington GPO 1973 338 p refs Hearings before Subcomm. on Energy of Comm. on Finance, 93d Congr., 1st Sess., 27, 28 and 29 Nov. 1973
(GPO-25-047) Avail: SOD HC $2.40

Planning criteria relative to a national research, development, testing, and evaluation program directed to the enhanced recovery of crude oil and natural gas was submitted during discussions before Congress of fiscal policy and the energy crisis. A definition of the energy problem is provided which considers the implications of the crisis on the national economy and balance of payments, fiscal incentives on the supply side and fiscal disincentives on the demand side, as well as U. S. trade policy concerning importation and exportation of energy resources. Federal energy research and development funding is also outlined. A.A.D.

N74-34430# Committee on Finance (U. S. Senate).
FISCAL POLICY AND THE ENERGY CRISIS, PART 3
Washington GPO 1974 440 p refs Hearings on S. 2806 before Subcomm. on Energy of Comm. on Finance, 93d Congr., 1st and 2d Sess., 27, 28 and 29 Nov 1973; 23, 24, 25, 28 and 29 Jan. 1974
(GPO-28-243) Avail: SOD HC $3.15

The removal of price controls over the energy sector and the regulation of natural gas prices, as well as tax measures aimed at increasing energy supplies, decreasing residential energy consumption, and discouraging excess profits was the focus of a Congressional hearing whose purpose was to discuss fiscal policy in relation to the crisis. Energy reserves and the production of energy on nonpublic lands are discussed, along with proposed administration of a trust fund to support energy research and development. A.A.D.

N74-34431# Committee on Finance (U. S. Senate).
FISCAL POLICY AND THE ENERGY CRISIS, PART 4
Washington GPO 1974 547 p refs Hearings on S. 2806 before Subcomm. on Energy of Comm. on Finance, 93d Congr., 1st and 2d Sess., 27, 28 and 29 Nov. 1973; 23, 24, 25, 28 and 29 Jan. 1974
(GPO-28-243) Avail: SOD HC $4.45

Safety procedures are described which pertain to the use of nuclear materials for energy production, and information is presented regarding the development of coal gasification projects by the U. S. gas industry, for the purpose of informing Congress of ongoing energy research and development efforts to be considered in the formation of a total national energy policy based on fiscal responsibility. U. S. policy towards the Organization of Petroleum Exporting Countries cartel is reviewed, and both commercial and natural resources are considered in an effort to evaluate the chances for American energy-sufficiency before 1985. Data which illustrate oil company profitability are provided, and the impact of solar energy applications on the economics of energy supply and demand is discussed. The range of fiscal proposals aimed at the alleviation of the energy crisis are assessed both by commercial and governmental interests. A.A.D.

N74-34432# Committee on Public Works (U. S. Senate).
A LEGISLATIVE HISTORY OF THE CLEAN AIR AMENDMENTS OF 1970 TOGETHER WITH A SECTION-BY-SECTION INDEX, VOLUME 1
Washington GPO Jan. 1974 785 p refs Presented by Environ. Policy Div. of the Congr. Res. Service, Library of Congr. to the Comm. on Public Works, 93d Congr., 2d Sess., Jan.

1974 Prepared by Library of Congr.
(GPO-26-274) Avail: SOD HC $5.30

This comprehensive manuscript outlines governmental policies designed to make substantial improvements in the air quality of the U.S.A. Significant debates and documents that led to the implementation of the Clean Air Act are compiled. G.G.

N74-34433# Atomic Energy Commission, Washington, D.C.
TRANSPORTATION SYSTEMS Subpanel Report 13 used in Preparing the AEC chairmans Report to the President
E. N. Petrick 27 Oct. 1973 314 p refs
(WASH-1281-13) Avail: NTIS HC $18.75

The transportation energy research and development goals are identified as the development of the technology necessary to reduce transportation demand for crude oil and other fuels by improved efficiency, new designs with higher efficiencies, and utilization of alternative fuels. The reduction of transportation dependence on crude oil by 22% in the year 1985, 55% in the year 2000, and up to 100% after the year 2000, from the levels of consumption that would otherwise be experienced without the proposed program is called for. The transportation sector is grouped into the four subprograms of autos/trucks, air, rail/bus, and ships. The contribution of each to the overall goal is presented, along with a summary of the transportation energy research and development funding proposal.
Author (NSA)

N74-34434# Commonwealth Scientific and Industrial Research Organization, Sydney (Australia).
[STANDARDS DETERMINATION FOR INSTRUMENTS, ELECTRICITY, RADIO FREQUENCIES, OPTICS, MAGNETISM, ATMOSPHERICS, AND PHYSICS] Biennial Report, 1971 - 1973
[1974] 123 p refs
(NP-19951) Avail: AEC Depository Libraries HC $8.25

This report describes the activities of the laboratory in: length interferometry; engineering metrology; photogrammetry; mass, volume, density, and pressure measurement; force, hardness, and materials testing machines; vibration; corrosion; time and frequency; acoustics; electrical standards; power frequency; high voltage; RF and microwave measurement; temperature measurement; optical radiometry; optics; dielectrics; magnetics; thermal and elastic properties of solids; electron transport in metals; low-energy collisions in gases; physics of the fluid state and high pressures; water vapor physics; viscometry; airglow; solar physics; and theoretical astrophysics. NSA

N74-34435# Federal Aviation Administration, Washington, D.C.
COMMUTER AIR CARRIER OPERATORS AS OF SEPTEMBER 1973 Information and Statistics Div.
Apr. 1974 61 p
(AD-781518) Avail: NTIS CSCL 01/2

There were 174 Commuter Air Carriers who reported operations to CAB for the quarter ending September 30, 1973, an increase of 22.5% over last year. The number of aircraft operated by these carriers increased 13.8% to 855 units with an estimated value of $159,699,000. Available seats increased 18.7% from 8,300 in 1972 to 9,900 in 1973. During this three month period there were 234,000 flights made by this group, 6.8% above the 219,000 reported for last year. GRA

N74-34436# Naval Postgraduate School, Monterey, Calif.
LOCKHEED AIRCRAFT CORPORATION CASE STUDIES IN MANAGEMENT M.S. Thesis
Landon G. Cox, Jr. Jun. 1974 40 p refs
(AD-781865) Avail: NTIS CSCL 05/1

Although the Lockheed Aircraft Corporation emerged from World War II with a reputation as one of the leading U. S. manufacturers of military and civilian aircraft, by 1971 Lockheed had amassed debts of over $700 million and claimed it would be forced into bankruptcy unless federal loan guarantees were granted to its creditors. The report consists of three independent case studies intended for use in the management curriculum in courses on general management but have other financial overtones. (Modified author abstract) GRA

N74-34437*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
BOOK OF PROCEEDINGS OF THE INTERAGENCY SYMPOSIUM ON UNIVERSITY RESEARCH IN TRANSPORTATION NOISE, VOLUME 1
Mar. 1973 403 p refs Symp. held at Stanford, Calif., 28-30 Mar. 1973 Sponsored in part by NASA, DOD, and NSF
(Contract DOT-OS-30055)
(NASA-CR-140151; AD-781174; DOT-TST-74-23-Vol-1) Avail: NTIS HC $23.25 CSCL 13/6

The intent of the Interagency Symposium on University Research in Transportation Noise was to focus attention on university research in basic and applied noise problems related to transportation. The purpose of these proceedings is to record and discuss current research studies, and objectives of research programs. Volume 1 of the Proceedings covers papers presented on jet noise, rotor noise, noise from moving bodies and from interaction of jets with solid surfaces. Author (GRA)

N74-34438*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
BOOK OF PROCEEDINGS OF THE INTERAGENCY SYMPOSIUM ON UNIVERSITY RESEARCH IN TRANSPORTATION NOISE, VOLUME 2
Mar. 1973 421 p refs Symp. held at Stanford, Calif., 28-30 Mar. 1973 Sponsored in part by NASA, DOD, and NSF
(Contract DOT-OS-30055)
(NASA-CR-140152; AD-781175; DOT-TST-74-23-Vol-2) Avail: NTIS HC $24.25 CSCL 13/6

The intent of the Interagency Symposium on University Research in Transportation Noise was to focus attention on university research in basic and applied noise problems related to transportation. The purpose of these proceedings is to record and discuss current studies, and objectives of research programs. Volume 2 of the Proceedings covers papers presented on sound propagation through ducts, combustion noise, high intensity sound, selected problems, and societal problems.
Author (GRA)

N74-34439# Abcor, Inc., Cambridge, Mass. Walden Research Div.
DEVELOPMENT OF A METHODOLOGY TO ALLOCATE LIQUID FOSSIL FUEL CONSUMPTION BY COUNTY Final Report, Feb. 1973 - Mar. 1974
Josette C. Goldish, Franklin D. Trowt, John R. Ehrenfeld, Khee M. Chng, and Richard Stockdale Mar. 1974 139 p refs
(Contract EPA-68-02-1067)
(PB-232209/7; EPA-450/3-74-021) Avail: NTIS HC $10.00 CSCL 13B

Methods were developed for the routine determination of distillate and residual oil consumption by industrial, commercial, and residential consumers, as well as for gasoline and diesel fuel consumed by light and heavy duty motor vehicles. The resulting data are allocated to counties for input and storage in the National Emissions Data System (NEDS) area source format. In addition, seasonal fluctuations of fuel oil use by consumer category and geographic region, and references for determining sulfur content of fuel oils on a county basis, were analyzed. The report summarizes the methodologies that were developed and describes the computer processing techniques for reporting the data. GRA

N74-34440# Harvard Univ., Cambridge, Mass.
TASSIM: A TRANSPORTATION AND AIR SHED SIMULATION MODEL. VOLUME 1: CASE STUDY OF THE BOSTON REGION Final Report, 1 Apr. 1973 - 31 May 1974
Gregory K. Ingram and Gary R. Fauth May 1974 107 p refs
(Contract DOT-OS-30099)
(PB-232933/2; DOT-OS-30099-5) Avail: NTIS HC $4.50 CSCL 13B

The TASSIM model integrates an urban transportation planning model, vehicle emission factors and simple air diffusion models in a simulation framework that can be used to analyze the air quality effects of transportation policies. The model is spatially disaggregated, and it is compatible with data sources available in many metropolitan areas. This volume briefly describes the structure of the model and then analyzes several model applications that simulate for Boston the air quality effects of transportation control land use, and stationary source policies. The transportation control policies are evaluated in a cost

effectiveness framework. The final sections consider possible extensions of the model and outline the model's computational aspects. GRA

N74-34441# Harvard Univ., Cambridge, Mass.
TASSIM: A TRANSPORTATION AND AIR SHED SIMULATION MODEL. VOLUME 2: PROGRAM USER'S GUIDE Final Report
Gregory K. Ingram, Gary R. Fauth, and Eugene A. Kroch May 1974 201 p refs
(Contract DOT-OS-30099)
(PB-232934/0; DOT-OS-30099-6-Vol-2) Avail: NTIS HC $5.75

The TASSIM model integrates an urban transportation planning model, vehicle emission factors, and simple air diffusion models in a simulation framework that can be used to analyze the air quality effects of transportation policies. The model is spatially disaggregated, and it is compatible with data sources available in many metropolitan areas. Designed to aid others in using TASSIM, this volume describes the computer programming steps in the model, the input data required by various subprograms, and the procedures used to calibrate the model to a metropolitan area. The volume also includes an outline of the programming changes needed to simulate various policies, and a listing of the model's FORTRAN code. GRA

N74-34442# Federal Energy Office, Washington, D.C. Office of Energy Analysis.
NATIONAL PETROLEUM SUPPLY AND DEMAND, 1974. POST-EMBARGO
26 Apr. 1974 56 p
(PB-232489/5; FEO-EATR-74-2) Avail: NTIS HC $3.75 CSCL 21D

An analysis of the National petroleum supply and demand situation is presented. The assumptions underlying the estimation of petroleum product supply are discussed. The results of implementing the forecasting model under two scenarios which take the lifted embargo into account and distinguish between two estimates of demand. Appendices present an outline of the simulation model itself and the data files which support the forecasts. Author (GRA)

N74-34443# Army Aviation Systems Command, St. Louis, Mo. Systems Analysis Office.
COST EFFECTIVENESS MODEL 1: PROTOTYPE SELECTION AND TRADE-OFFICE ANALYSES
M. Zaki El-Sabban May 1974 22 p refs
(AD-781947; AMSAV-D-74-14; USAAVSCOM-TR-74-23) Avail: NTIS CSCL 01/3

The report presents a methodology that would guide a Product/Project Manager in making an informed selection from among several single prototype aircraft, based upon cost and effectiveness considerations. Measures of effectiveness are defined and a cost-effectiveness index (effectiveness per dollar) is determined and recommended as a basis for selection. A numerical example is presented, demonstrating the application of this model. Author (GRA)

N74-34444# Informatics, Inc., Rockville, Md.
RECENT TRENDS IN SOVIET RESEARCH
Stuart G. Hibben 30 Jun. 1974 35 p refs Transl. into ENGLISH from various RUSSIAN journals
(Contract F44620-72-C-0053)
(AD-782288) Avail: NTIS CSCL 05/2

This is a brief collection of abstracts on a variety of recently noted R and D topics from the Soviet technical and popular press. Topics include laser heating, radioholography, laser isotope separation, plasma generation, basalt fiber, and superconductivity. GRA

N74-33977* Joint Publications Research Service, Arlington, Va.
CHARACTERISTIC FEATURES OF DETERMINING THE LABOR INPUT AND ESTIMATED COST OF THE DEVELOPMENT AND MANUFACTURE OF EQUIPMENT
T. I. Kurmanaliyev and A. V. Breslavets *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 3-10 refs Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 8 p (For availability see N74-33976 23-15)
CSCL 05C

N74-33978* Joint Publications Research Service, Arlington, Va.
PERT SIMULATION OF EXPERIMENTAL DESIGN WORK
T. I. Kurmanaliyev and A. S. Pishchulin *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 11-14 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 4 p (For availability see N74-33976 23-15)
CSCL 05A

N74-33979* Joint Publications Research Service, Arlington, Va.
MULTITOPIC LOAD CHART FOR THE DESIGN OFFICE SUBDIVISON
A. S. Pishchulin *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 15-20 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 6 p (For availability see N74-33976 23-15)
CSCL 05A

N74-33980* Joint Publications Research Service, Arlington, Va.
ORGANIZATION OF OPERATIONS WITH RESPECT TO CHECKING DRAWINGS (DRAWING CHECKING PROCEDURE)
L. M. Greys and S. G. Namestnik *In its* Technol. for the Production of Space Equipment (NASA-TT-F-15766) Sep. 1974 p 21-24 Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Kosmicheskoy Apparatury" Moscow, Nauka Press, 1974 4 p (For availability see N74-33976 23-15)
CSCL 14D

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